FILE: RUSSELL, J.S. ADM, USN

POST 46 CF IND. PERS.

DEPARTMENT OF THE NAVY
OFFICE OF THE CHIEF OF NAVAL OPERATIONS
WASHINGTON, D.C. 20350

IN REPLY REFER TO
PRSCO:JSR:lds
Ser 0389P05
16 October 1967

~~CONFIDENTIAL~~
CONFIDENTIAL DECLASSIFIED

From: Director, Panel to Review Safety in Carrier Operations
To: Chief of Naval Operations

Subj: Submission of Final Report of Panel to Review Safety in Carrier Operations

Ref: (a) CNO ltr Op-05/ab Serial 20P05 of 21 August 1967

1. In accordance with reference (a), I have the honor to submit herewith the final report of my Panel.

2. My visit to the carriers and their Air Wings in action in the Southeast Asia area has left me with a profound appreciation for the consummate skill and bravery with which a difficult and necessary military task is being carried out. Our leadership in the air and on the ships is superb. The equipment is generally sound and functions as its designers intended.

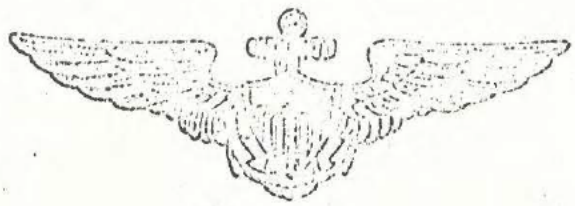
3. Safety in carrier operations has been served well by many improvements since World War II and the Korean hostilities. The angled deck for aircraft recovery, the steam catapult for launching, the stabilized optical landing system, the precision approach radar, have all shared in the advance. The elimination of highly flammable aviation gasoline and the substitution for it of the especially stable jet fuel, JP-5, has decreased the incidence of carrier fires. The improvements we suggest are beyond these, and fall generally into three groups, - (1) improvement of flight deck fire fighting equipment to provide a remotely controlled massive suppressant for fires on the flight deck at least equivalent to that we have on the hangar deck, (2) provide for better personal survival in damaged ships by improvement in equipment and training, and (3) improvement in aviation ordnance handling procedures and documentation.

4. Let me express my profound appreciation for the personnel assigned to my panel. One could not wish for a more dedicated and knowledgeable group to deal with the important subject assigned us.

James S. Russell
JAMES S. RUSSELL
Admiral, U.S. Navy (Ret)

DECLASSIFIED CONFIDENTIAL

REPORT OF THE PANEL TO REVIEW SAFETY IN CARRIER OPERATIONS



ADMIRAL JAMES S. RUSSELL USN (RET.)
DIRECTOR

TABLE OF CONTENTS

BASIC REPORT

ANNEXES

SECTION I

ABSTRACT

SECTION II

APPOINTING LETTER

DEPARTMENT OF THE NAVY
OFFICE OF THE CHIEF OF NAVAL OPERATIONS
WASHINGTON, D.C. 20350

IN REPLY REFER TO
Op-05/ab
Ser 20P05
21 AUG 1967

From: Chief of Naval Operations
To: Admiral James S. Russell, USN (Ret.)

Subj: Appointment as Director, Panel to Review Safety in Carrier Operations

Encl: (1) List of Panel Members
(2) Terms of Reference

1. You are hereby appointed Director of a Panel to Review Safety in Carrier Operations. The names of the memb[illegible] your panel are listed in enclosure (1).

2. As Director your task is to examine actual and potential causes of fires and explosions in aircraft carriers with the object of minimizing their occurrence, limiting injuries and damage that result when they occur, and greatly improving the effectiveness of fire fighting and the control of explosive damage particularly on the flight deck and in the hangar.

3. Enclosure (2) provides suggested terms of reference to assist in the orientation of your panel. The terms of reference are not limiting and are subject to modification as deemed necessary or desirable by the Panel.

T. H. MOORER
ADMIRAL, U.S. NAVY

Copy to:
Panel Members

DECLASSIFIED

LIST OF PANEL MEMBERS

DIRECTOR: Admiral James S. Russell, USN (Ret.)

MEMBERS:

2 Rear Admiral Paul D. Buie
Commander, Naval Aviation Safety Center

3 Captain James L. Holloway, III

4 Captain R. E. McCall, (Op-72C)

5 Commander [redacted], Air Systems Command

6 Commander [redacted], Ships Systems Command

Commander [redacted], CHINFO

7 Commander [redacted] (Op-701)

8 Commander [redacted] (Op-517C)

9 Lieutenant Commander [redacted]
(Fleet Training Group, Guantanamo)

10 Dr. [redacted]
Naval Ship Research & Development Center

11 Mr. [redacted]
(NOL White Oak)

12 Mr. [redacted], Ordnance Systems Command

13 Mr. [redacted]
(Annapolis Machine Laboratory)

YNCS [redacted], (BuPers)

~~CONFIDENTIAL~~

Encl (1)

PANEL TO REVIEW SAFETY IN CARRIER OPERATIONS

TERMS OF REFERENCE:

1. GENERAL. As an immediate result of explosive fires on FORRESTAL and ORISKANY and their serious consequences, a special panel is convened to conduct a thorough examination of the actual and potential causes of explosions and fires in aircraft carriers. It is essential that ways be found to minimize the occurrence of explosion and fire in aircraft carriers and to limit injuries and damage when they do occur. ORISKANY findings and the investigation of FORRESTAL fire now in progress should provide useful information for the Panel. The examination contemplated by this appointing order should be as broad and as complete as necessary to markedly improve the overall effectiveness of our measures and precautions for the prevention of fires and explosions in aircraft carriers. When in spite of all reasonable precautions explosions and fires do occur, it is essential that we have positive, fast and extremely effective means for minimizing damage, destruction and loss of life. It therefore is considered essential also that in coping with explosion and fire, personnel-exposure be minimal.

2. SCOPE. In accomplishing its tasks the panel may consider but is not limited to the following:

- Training and readiness

- Combat operations and procedures
- Weapons design and handling
- Fire and explosion control equipment and procedures
- Ship and aircraft design characteristics
- Safety equipment

3. It is suggested that the Panel will wish to commence its work with a review of the history of aircraft carrier fires and explosions. Data on ship design, ship modifications, safety equipment, fire fighting equipment, upkeep, supply, training, operations, weapons storage, weapons motion, weapons loading, safety procedures, operational readiness exercises, ship's requests for equipment, funding limitations and other matters related to operational safety is available. Other material, information or expert opinion and advice needed by the Panel, whether available in the Navy or otherwise, should be requested. It is desired that Panel conclusions and recommendations, when formulated, include material on

a. Actions to be taken immediately,

b. Actions to be programmed in the longer term.

SECTION III

PLANNED APPROACH

SECTION III -- PLANNED APPROACH

To carry out the responsibilities established by the terms of reference set forth in the appointing letter, and to accomplish the objectives of the Panel within the defined period of sixty days, a compact schedule and a very definite modus operandi for the Panel had to be established. The Panel's approach to its responsibilities, its schedule, and its methods of operating are described in the following:

A. Panel operations were divided into three phases: the collection of data, the collating of that data, and the evaluation of the data with the generation of recommendations therefrom. Because of the short time available to the Panel, the work in the three phases would have to be somewhat concurrent.

B. Based upon this plan, the following schedule was established:

PHASE	INCLUSIVE DATES
I. Collect Data	
A. Briefings	15 Aug - 30 Sep
B. Document Survey	15 Aug - 30 Sep
C. Field Visits	16 Aug - 22 Sep
II. Collate Data	
A. Determine subtasks	11 Sep
B. Organize Subcommittees	12 Sep
C. Develop Subcommittee areas of responsibility	12 - 30 Sep
III. Evaluate Data & Generate Recommendations	
A. Subcommittee Action	1 - 6 Oct
B. Full Panel Review	4 - 11 Oct
C. Panel Recommendations	11 - 14 Oct

C. For the collection of data, several approaches were available to the Panel. First were field trips, in which the Panel members could observe and interrogate in the actual operating environment. Second was data acquisition through briefings and presentations. Third was the survey of the existing pertinent literature. In furthering individual projects, Panel members were to arrange interviews and conduct individual research as necessary.

1. In arranging for field trips, authority to make the visit was requested from the cognizant commander, and briefings requested in specific areas of interest to the Panel.

a. A most important field trip was the visit to attack carriers operating in the Gulf of Tonkin made by Admiral Russell and five Panel members. Additional field trips involving the entire Panel were undertaken to visit both the Air Type Commanders, the Fleet Training Commanders and the Service Force Commanders of both the Atlantic and Pacific Fleets. Admiral Russell personally called on both Fleet Commanders. Commander-in-Chief, Pacific Fleet received a team briefing by the six members of the Panel who made the trip to the Gulf of Tonkin.

b. While on the west coast, the Panel visited the Fallbrook Annex of the Seal Beach Naval Ammunition Depot to observe the receipt, assembly, checkout and shipment preparation of air-launched guided missiles. A visit to the Naval Weapons Center, China Lake included briefings from representatives from that command as well as from the Naval Underwater Weapons Center, Pasadena; the Naval Weapons Center Laboratory, Corona; the Naval Weapons Experimental Facility, Albuquerque; and the Naval Missile Center, Point Mugu.

c. In addition to visiting the Atlantic Fleet commands, while in the Norfolk area, the Panel went aboard the USS FORRESTAL to observe first-hand the extent of the damage caused by the fire and explosions.

d. One day trips were made out of Washington to visit the Naval Weapons Laboratory, Dahlgren; the Naval Ordnance Laboratory, White Oak, Maryland; and the Weapon Systems Test Division of the Naval Air Test Center at Patuxent River, Maryland.

2. Briefings to be presented before the full Panel in the Pentagon were requested by letter from the CNO to the Chief of Naval Material and the Chief of Naval Personnel. Presentations from OPNAV activities were requested by memorandum. In each case, the desired subject matter and areas of interest were carefully delineated, and briefers were requested to furnish copies of their presentations and graphics for the Panel files.

3. The review of the applicable literature was conducted primarily by the Panel members who did not make the trip to the Western Pacific. A machine listing of the documents relating to the Panel's areas of interest was requested from Navy Automated Research and Development Information System (NARDIS). This list was screened, and those items of direct interest

to the Panel's work were obtained, reviewed, and a brief summary of their content prepared. File cards were maintained to provide a ready reference source for use by all Panel members in pursuing individual research. A listing of these documents pertinent to the Panel's work has been collected as a selected bibliography in Annex B to the basic report.

4. Many visits, conferences and interviews were arranged by Panel members in the prosecution of their individual research. Some of the most important of the meetings are listed in Annex D to this basic report.

D. To carry out the tasks involved in Phases II and III of the Panel's work, the collation of data and the generation of recommendations, a flexible and responsive organization was required, yet one which completely covered the full range of Panel responsibilities.

1. To satisfy these requirements, four functional subcommittees were established under a Panel Coordinator, reporting to the Director through the Deputy Director.

a. Early experience acquired during the data collection phase indicated that there would be nine basic areas of interest:

(1) Ships Material
(2) Personal Equipment
(3) Aircraft Systems
(4) Weapons
(5) Training
(6) Documentation
(7) Personnel
(8) Organization
(9) Operations

b. These nine functional areas were assigned, in combination, to the four subcommittees. Subcommittee chairman assignments were made on the basis of qualification in the particular areas as the result of professional training, experience and current duty assignment. All other Panel members were assigned to a subcommittee, again on the basis of individual qualification.

2. In the course of the Panel's activities, the members were exposed to briefings, documents, demonstrations and tours. This experience, plus the individual member's own professional background, served to generate ideas which would constitute the central thought of a recommendation. Each Panel member was encouraged to develop these ideas for eventual consideration as a Panel recommendation.

a. Ideas of special merit and timeliness were to be submitted immediately to the Panel Director in writing, so that, if warranted, these ideas could be recommended to the CNO for implementation in advance of the Panel's final report.

b. Recommendations of a less urgent nature were generally to be developed by individual members during Phase II of the Panel's deliberations and submitted in recommendation form, with accompanying rationale, to the cognizant subcommittee chairman. Rationale for each recommendation was to include background, discussion, justification, and contain identifying references to specific supporting documentation and testimony.

c. The function of the subcommittee chairman was to screen recommendations, combining where necessary, and revising to achieve standardization in format and expression. It was the general policy of the Panel not to reject ideas submitted by individuals at this level. It was felt that each member should have access to the Director to present his ideas and supporting views.

d. Although individual Panel members were assigned to specific subcommittees, their recommendations did not have to be confined to the functional areas covered by his subcommittee. It was only required that all recommendations be submitted to the cognizant subcommittee chairman for review and coordination.

3. Subcommittee chairmen reviewed individual submissions, combining some recommendations, and returning those in which duplication appeared. Where rationale was weak or required additional factual documentation, subcommittee members were tasked to conduct additional research either to strengthen the recommendation, or to serve as the basis for rejection.

4. Recommendations were presented to the entire Panel for review, not necessarily for unanimous concurrence, but for coordination purposes. As has been pointed out earlier, it was considered only proper that any Panel member be permitted to submit his views to the Director, regardless of Panel endorsement.

5. Recommendations were finally submitted by the Panel Coordinator through the Deputy Director to the Director for final approval. For each recommendation a supporting rationale was provided and these are tabulated in Annex A. These rationales contain the specific background and factual justification of each recommendation.

SECTION IV

NARRATIVE

SECTION IV -- NARRATIVE OF PANEL ACTIVITY

A. Following the serious fires aboard the USS ORISKANY and the USS FORRESTAL, the Chief of Naval Operations convened the Panel to Review Safety in Carrier Operations under the directorship of Admiral James S. Russell, USN (Ret). The appointing letter with the terms of reference and the Panel membership appear as Section II of this report.

B. The Panel met for the first time on Tuesday, 15 August 1967 with all members present. Office spaces were provided in the OPNAV area of the Pentagon where all home activities of the Panel took place. The balance of the initial week was devoted to organizational matters, schedule planning, and a series of briefings covering current fleet operations in SEASIA, present and projected ordnance handling techniques, the FORRESTAL and ORISKANY fires, and recent advances in fire fighting technology.

C. On 20 August 1967, Admiral Russell, RAdm Buie, Capt McCall, Cdr (b) (6), Cdr (b) (6), Mr. (b) and Senior Chief (b) (6) departed by special air mission KC-135 for a trip to the Western Pacific to observe combat operations aboard attack carriers operating in the Gulf of Tonkin.

1. En route, Admiral Russell and his party conferred with Commander in Chief Pacific Fleet (CINCPACFLT) and members of his staff in Hawaii on 21 August, and were briefed on the organization, employment schedules, and the material condition of the Pacific Fleet CVAs.

2. The party arrived at NAS Cubi Point, Subic Bay, Philippine Islands, on 23 August and transferred immediately to a C-2A aircraft for further transportation to the USS CONSTELLATION in the Tonkin Gulf.

3. The party divided into groups of two to visit the Yankee Station carriers in rotation over the period 23 to 31 August 1967. Thus all members of the party were able to observe two days of strike operations aboard each of the CVAs: CONSTELLATION, ORISKANY, INTREPID, and CORAL SEA.

4. Returning to the Philippines, the party toured the Cubi Point Naval Magazine and were briefed by Commander Naval Base, Subic Bay, on 2 and 3 September.

5. On 5 September, in Hawaii en route to CONUS, Admiral Russell and the members of his party briefed CINCPACFLT, Commander Service Force Pacific (COMSERVPAC), and their respective staffs on the West Pac visit.

D. Those members of the Panel who did not accompany Admiral Russell on the West Pac trip remained in Washington and worked up detailed planning for the follow-on panel operations. Arrangements for future field trips were effected, a series of briefings scheduled, and a large part of the relevant literature reviewed, summarized, and catalogued.

E. On 6 September the entire Panel rendezvoused at NAS San Diego to commence a tour of West Coast activities.

1. 6 September was devoted to conferences with COMNAVAIRPAC and his staff at NAS North Island.

2. On the morning of 7 September, the Panel visited the Fallbrook Annex to the Naval Weapons Station Seal Beach, to be briefed on and observe the handling of air-launched guided missiles en route to and from fleet units.

3. The Panel visited the Training Command, Pacific Fleet during the afternoon to be briefed by COMTRAPAC and his staff and to observe at first hand, fire fighting demonstrations by instructors and students at the Fleet Fire-Fighting School, San Diego.

4. On 4 September the Panel travelled to the Naval Weapons Center, China Lake for a day-long series of briefings on air-launched weapon criteria, design, development, and testing, by NWC staff personnel, and by representatives from the Naval Weapons Experimental Facility Albuquerque, Naval Missile Center, Pt. Mugu, Naval Undersea Warfare Center, Pasadena, and the Naval Weapons Center, Corona Laboratories. The Panel departed for Washington on 9 September after a morning seminar at the Weapons Center.

F. During the week of 11 September, briefings to the full Panel were resumed. A list of all briefings presented to the Panel is contained in Annex C to this report. Also, during this week, the Director briefed the VCNO, DCNO (AIR), Chief of Naval Material, the Chief of Naval Personnel, and the Commanders of the Systems Commands on the trip to West Pac. In addition, he visited the Fire Fighting and Damage Control School at Treasure Island on 16 September.

G. On 18 and 19 September, the full Panel was in Norfolk, Va., for a series of briefings and conferences with Commander Air Force, U.S. Atlantic Fleet, Commander Service Force, U.S. Atlantic Fleet and Commander Fleet Training Command, U.S. Atlantic Fleet, and their principal staff members.

1. The Panel also visited the USS FORRESTAL to witness the extent of damage caused during the fire and explosions of 29 July 1967.

2. The Inspector General of the U.S. Atlantic Fleet attended the conference at COMNAVAIRLANT Headquarters, and participated in the discussions on Atlantic Fleet Damage Control Readiness.

3. Admiral Russell called on the Commander in Chief, U.S. Atlantic Fleet to brief him on the Panel's work. The Director also conferred with RAdm F. Massey USN, Senior Member of the Board investigating the FORRESTAL fire, and revisited the USS FORRESTAL for discussions with the Commanding Officer, Chief Engineer, Damage Control Assistant and other key officers.

H. The Panel returned to Washington and from 20 to 29 September engaged in collecting and collating data receiving presentations, conducting interviews and conferences, and pursuing individual research. During this time several one-day field trips out of Washington were made by the entire Panel.

I. On 20 September, the Panel helicoptered to the Naval Weapons Laboratory, Dahlgren for a day of briefings and a look at the bomb cook-off tests, magazine explosion test rig and other facilities.

J. On 25 September the Panel travelled to the Naval Ordnance Laboratory, White Oak, Maryland for briefings on the safety features in fuze and weapon design.

K. On 29 September the Panel helicoptered to the Naval Air Test Center, Patuxent, Md., to visit the Weapons Systems Test Division. Static displays of air launched weapons, weapon-loaded operational aircraft, and weapon-associated support equipment were arranged for the Panel's close examination.

L. Although some briefings extended into the week of 2 October 1962, the Panel's effort was shifted to Phase III of the prosecution of tasks: the evaluation of data and the generation of recommendations. Members met in subcommittees to draft recommendations and supporting rationale.

M. The last scheduled presentation before the Panel was completed on 6 October 1967, and Panel work was then devoted to the preparation of the final report.

N. The final report was completed, signed, and delivered to the Chief of Naval Operations on 16 October 1967.

SECTION V

CONCLUSIONS

SECTION V -- CONCLUSIONS

A. The Director and Panel, from personal observation and other investigations, have been tremendously impressed by the magnificent performance of our attack carriers and supporting organizations under most difficult conditions. They are, in fact, fighting a very real, but undeclared, war with something less than complete support from the Nation. This has resulted in a tempo of operations, both in the forward and rear areas, that is stretching our personnel and material resources to the limit. Much of what is contained in this report is beyond the ability of individual units to correct; however, they deserve the best and most vigorous support that the Navy can produce.

The Panel was forced to conclude that deficiencies do exist in the CVA weapons system that have a direct bearing on the prevention of fires and explosions on board carriers and the ability to cope with these situations rapidly and effectively. These deficiencies are grouped into nine categories which are dealt with in detail in Section VI. These categories and a brief description of the deficiencies are:

1. Ships Material - By far the most serious deficiency in this category is inadequate fire protection for the flight deck. Major improvements are required both in ships fixed installations and in mobile and portable fire-fighting equipments in order to respond rapidly and effectively in circumstances similar to those obtaining during the FORRESTAL fire. Improvements in hangar-deck fire protection are also required, but the magnitude of improvements do not approach that required on the flight deck and are concerned essentially with moving certain fire-fighting stations, adding sprinklers to sponsons, possibly employing new fire-fighting materials, and improving controls, communications and habitability in conflagration, and air-weapons-movement control stations.

A most serious deficiency in CVAs is inadequate provision for handling the large quantities of conventional munitions required by today's carrier combat operations and the electronic radiation environment in which munitions are handled. Serious hazards to carriers result directly from these deficiencies which require large quantities of munitions to be exposed on the flight deck and the hangar-deck sponsons. No ready solution to this situation exists and nothing short of a long-range, expensive, time-consuming ship modification program will correct the situation. Recognizing this, many of the recommendations of this report are intended to ameliorate the risk rather than to correct the basic deficiency. The Improved Rearming Rate Program, which the Panel strongly endorses, is intended to be a long-range solution to this problem.

2. Personal Equipment - Of great importance in the handling of emergencies resulting from fire and explosion on a carrier is the personal equipment available for use in combating the situation and in individual

survival in a smoke/fire environment. Not much improvement has been made in these equipments since World War II. Major improvements are required and, with the advanced technology now available, these improvements should not be too difficult.

3. Aircraft Systems - In reducing risk on a carrier, improvement in the survivability of aircraft and simplification of their munitions-carrying systems is required. Survivability improvement in aircraft is possible through the reduction of fire hazard in aircraft fuel systems. Reticulated foam fuel-tank fillers and crash-resistant fuel cells can contribute to this effort. The multiplicity of munitions that can be carried by carrier aircraft and the associated maze of racks, safing devices and checkout procedures invite human error. A major effort should be made to simplify this system from the airframe to the munition. Associated with this latter effort, there should be a quantum improvement in weapons handling and loading equipment for use on carriers.

4. Weapons - Deficiencies exist in some of the weapons and fuzes in use on board carriers which are inherently dangerous. For example, chemical long-delay fuzes are unsafe for shipboard use because fuze activation cannot be detected. The CBU 24 and some fuzes suffer from poor quality control. Some of the munitions are inherently HERO (Hazards Electromagnetic Radiations to Ordnance) unsafe. Rocket motors have no environmentally controlled safety devices. In addition to correcting the above deficiencies, a developmental program should be undertaken aimed at increasing significantly the cook-off time of weapons when exposed to fires.

5. Training - Many factors influence training, both individual and team, but the most significant are the short turnarounds of carriers between deployments and the personnel-assignment practices which result from a paucity of personnel assets. These two factors make a satisfactory solution of the training problem most difficult, but since successful and safe mission accomplishment is so largely dependent on adequate training, a determined effort should be made to improve the situation. Piecemeal improvements can be made, however, and are so recommended in Section VI.

6. Documentation - The most serious deficiencies in documentation concern the technical publications and handbooks relating to weapons. Simple, concise, easy-to-follow technical instructions are needed for each weapon. They should be designed for use in the carrier environment and should be provided to the Fleet prior to weapon introduction. Also needed is a carrier munitions load-out certification to identify what munitions may be on which carriers and to show where the munitions may be stowed.

7. Personnel - Personnel deficiencies stem from an overall shortage of available personnel assets which can only be corrected by major policy changes. Improvements can be made in some details, however, and these are recommended in Section VI.

8. Organization - The organization of attack carriers is basically sound. Some ambiguities exist in the responsibilities assigned to certain personnel such as the Air Officer and Damage Control Assistant, in the duties of crash and salvage crews, in fire-fighting organization and doctrine, and in hazardous-material control. These, though important, should not be difficult to resolve.

9. Operations - Certain items concerning operations, when considered alone, appear to be desirable. However, since they cannot be decided in isolation, other considerations may be overriding. Among these are:

a. A downward adjustment of the CVA Deck Multiples, particularly on the ESSEX Class carriers, to relieve dangerous congestion.

b. Increased emphasis on all facets of Damage Control (DC) Readiness including

(1) Augmentation of allowance of DC ratings

(2) Special funding to remove damage-control and ship safety items from competition within the Operating Target (OPTAR)

(3) The use of DC training assistance field teams

B. Although the Panel was tasked to examine actual and potential causes of fires and explosions in aircraft carriers with the object of minimizing their occurrence and limiting their effects, the extensive investigations conducted in the performance of that task made it inevitable that other conclusions, not directly related to that task, but of importance to the continued effectiveness of the Navy, would be formed. It is realized that some of the items enumerated may not be capable of early solution because of fiscal, political or other policy considerations but they are, nevertheless, included.

1. Aircraft Procurement - The practice of procuring tactical aircraft on such an austere basis that squadrons, between deployments, have on board for training only about half of their organizational complement of aircraft now jeopardizes safety of aircraft operations and will ultimately affect the ability of Navy pilots to deliver munitions on target.

2. Navy Safety Organization - It is evident that more attention must be paid to safety throughout the Naval establishment, but particularly in the operating forces. RAdm Dubois, senior member of a board to conduct a Review of the Department of the Navy Safety Program, has, on 4 October 1967, submitted a detailed report on the subject. While it is not possible to endorse the detailed recommendations of that report, nor is it known whether resources are available to support them, the basic premise of establishing a Navy-wide safety organization is strongly supported. In establishing such

an organization, however, care should be taken not to emasculate the Naval Aviation Safety Center's efforts in the field of aviation accident-prevention during the formative and growth period of the new organization, nor to establish an organizational structure which will negate the responsiveness of the Naval Aviation Safety Center to the DCNO (AIR), the Naval Systems Commands and to fleet and field aviation activities.

3. Tempo of Operations - Every opportunity should be taken to reduce the present tempo of operations for attack carriers and their air wings until a reasonable reserve of aircraft and squadron personnel has been built-up, and the material condition of carriers has been improved. In particular, a more gradual introduction of ships and squadrons to the enormous demands of Yankee-Station Operations is considered essential. A Yankee-Team indoctrination period has been proposed for CVAs reporting to TF-77 for the first time during a deployment. During this period, the new carrier would operate on Yankee station at reduced tempo for about one week in areas of least AAA threat. The Panel strongly supports this proposal.

SECTION VI

RECOMMENDATIONS

1. Ship's Material

RECOMMENDATION #1-1 Advanced Flight Deck Fire Fighting System

A program be established to develop an advanced flight deck fire fighting system. Features of this system should include: remote control, massive and quick response, cooling for ordnance, sufficient redundancy to compensate for derangement of portions of the system, sufficient flexibility to cover all spotting conditions, compatibility with portable fire fighting systems and unseen devices. An important corollary which should be included in this priority is a means for quick drainage or dispersal of large quantities of spilled fuel from the flight deck. Consideration should be given to recent developments in chemical extinguishing agents and fire fighting devices. Development and evaluation of competitive designs should be encouraged. Proposed cognizance: NAVAIR

RECOMMENDATION #1-2 Purple K/Light Water System

The Purple K/Light Water fire extinguishing equipment be utilized in carriers to the maximum extent commensurate with its inherent capabilities. Areas to be investigated should include: an improved fire fighting vehicle, helo-borne equipment, fixed dispensing systems, application in the form of a bomb or grenade, and wider use of hand-held extinguishers. Tests should be conducted to demonstrate the effectiveness of the system in the flight deck environment (i.e., high winds and turbulence). Developmental efforts to make the system compatible with sea water should receive increased emphasis. Proposed cognizance: NAVAIR

RECOMMENDATION #1-3 Washdown Countermeasures System

Conflagration control on the flight deck be provided through the use of the Washdown Countermeasures System. Modifications which will be required include remote control from Pri Fly or the Navigating Bridge and replacement of all plastic pipe with metal pipe. In addition, sprinkling for the areas outboard of the island and on sponsons where ready service weapons are stowed should be installed. Augmentation of existing fire pump capacity may prove necessary in order not to degrade existing fire fighting system capability. Proposed cognizance: NAVAIR

RECOMMENDATION #1-4 Hangar Bay Protection

The hangar conflagration protection system be further improved by utilizing the latest techniques in fire fighting and fire detection. Consideration should also be given to insulating hangar boundaries to protect adjoining spaces. Proposed cognizance: NAVAIR

RECOMMENDATION #1-5 Improved Rearming Rates Project

Operations and Maintenance Navy (O&MN) funds be budgeted for continuing the Improved Rearming Rates Project in attack carriers during their next overhaul periods. Proposed cognizance: OPNAV

SECTION VI -- RECOMMENDATIONS

As the end result of the deliberations of the Panel to Review Safety in Carrier Operations, the recommendations contained in the following pages are made to the Chief of Naval Operations.

These recommendations are listed in order of relative priority and importance within the following categories:

1. Ship's Material
2. Personal Equipment
3. Aircraft Systems
4. Weapons
5. Training
6. Documentation
7. Personnel
8. Organization
9. Operations

The terms of reference suggested that recommendations be divided into short range and long range groupings. In the actual preparation of this report, such an arrangement was determined to be impractical as the recommendations did not readily fall into one group or another.

Some recommendations which were generated early in the course of the Panel's work had obvious merit and were capable of immediate accomplishment. These were submitted to the Chief of Naval Operations in advance of this report to be considered for immediate implementation. These recommendations have not been included in this list, but have been summarized in Section VII of this report.

The Panel has observed that a number of actions have already been initiated to improve safety in carrier operations which are similar to those recommended by the Panel. Such recommendations are being included in this report in order to support these independently generated efforts.

For each of the following recommendations, a supporting rationale has been included in Annex A.

RECOMMENDATION #1-6 Marking of Escape Routes

A standardized system of marking and lighting emergency escape routes in aircraft carriers be developed which is effective under conditions of very poor visibility caused by heavy smoke. Proposed cognizance: BAVSHIP

RECOMMENDATION #1-7 Additional Bomb Jettison Chutes

Additional bomb jettison chutes be installed on the flight deck, with opening provided in deck coamings in order that bombs may be rolled or pushed overboard without lifting. A hinged bar should be installed to close the flush entrance to the chute in order to preserve the function of the coaming against skidding aircraft. Proposed cognizance: BAVSHIP

RECOMMENDATION #1-8 Flight Deck Water Monitor System

The feasibility be investigated of installing on the island structure powerful monitor systems similar to that developed for the New York Fire Department by Delaval and John W. Stang capable of projecting large volumes of water up to 400 feet. As a corollary, study the practicability of installing a monitor of this type on escorting destroyer types so that they may assist in fighting carrier fires. Proposed cognizance: BAVSHIP

RECOMMENDATION #1-9 Interior Communications

Carriers be surveyed to insure that all inhabited areas are within sound range of 1MC speakers so that the general alarm will serve to alert all hands regardless of location. Proposed cognizance: BAVSHIP

RECOMMENDATION #1-10 Fire Hose

The specification for fire hose aboard carriers be changed to require rubber lined, double jacketed cotton, neoprene wrapped hose, to be used on flight deck and hangar deck in order to provide a more wear-resistant hose as well as one less subject to kinking. This hose should be then supplied to CVAs to replace cotton hose as it wears out. Developmental programs should be continued to improve fire hose by decreasing weight, increasing fire resistance, and providing a quick disconnect coupling for use in special areas such as the flight and hangar decks. Proposed cognizance: BAVSHIP

RECOMMENDATION #1-11 Ship Alterations Affecting Safety

All outstanding Ship Alterations and Repair Requests be reviewed for each CVA and those which affect fire fighting and damage control be placed in a "safety of the ship" category for appropriately high priority of accomplishment at Restricted Availabilities and Regular Yard Overhauls. Proposed cognizance: BAVSHIP

RECOMMENDATION #I-12 Liquid Oxygen Jettison

A systems review be accomplished to insure that suitable means exist for the safe, rapid jettisoning, of liquid oxygen from aircraft carrier O_2/N_2 plants during emergencies. Proposed cognizance: NAVMAT

RECOMMENDATION #I-13 Vari-Peg Nozzle

The "Vari-Peg" nozzle be evaluated as a possible beneficial replacement for the foam nozzle and shaper on flight deck and hangar deck High Capacity Fog Foam Stations. Proposed cognizance: NAVMAT

RECOMMENDATION #I-14 HCFF Maintenance

Failure rate on components of High Capacity Fog Foam stations be analyzed and parts support modified accordingly. A review of Planned Maintenance System requirements for HCFF stations should be made to insure a high state of readiness. Designs should be improved to greatly reduce the high rate of failure of proportioner seals. Proposed cognizance: NAVMAT

RECOMMENDATION #I-15 Relocation of Hangar Foam Monitors

Hangar foam monitors be relocated by raising them from the deck to the bulkheads at a height to prevent obstruction by parked aircraft. Control from the hangar deck to be by reach rods or flexible cable. The controls for the High Capacity Fog Foam Stations supplying the monitor should be placed in the vicinity of the handles operating the reach rods or flexible cable. Proposed cognizance: NAVMAT

RECOMMENDATION #I-16 Escape Ladders

Metal ladders from catwalks to sponsons, and from the island walkways to flight deck, be installed to provide additional weather-deck escape routes. Proposed cognizance: NAVMAT

RECOMMENDATION #I-17 CVA HERO Survey

A complete Hazards of Electromagnetic Radiation to Ordnance (HERO) survey of each CVA be required after each yard period or major modification to electronic equipment. Proposed cognizance: NAVMAT

RECOMMENDATION #I-18 Command and Control Station Vulnerability

An analysis be made of the vulnerability of the vital command and control spaces in the gallery deck of modern CVAs to determine if a change in design philosophy is warranted. At the same time a study should be made of state of the art techniques which might be applied to furnish added protection to these spaces. Proposed cognizance: NAVMAT

1. Ship's Material (Cont'd):

RECOMMENDATION #1-19 Missile Magazine Safety

An analysis be conducted of the effects in a carrier magazine as now configured of inadvertent motor ignition of a large missile such as Standard ARM. (b) (3) (A) [redacted] Proposed cognizance: NAVMAT

RECOMMENDATION #1-20 Portable Exhaust Blower

An effective portable explosion-proof electrical exhaust blower be developed which is capable of exhausting and filtering smoke from shipboard compartments. The blower should be small enough to fit through a 30" X 36" hatch, and as a possible objective should be capable of exhausting a main machinery room in thirty minutes. Proposed cognizance: NAVSEA

RECOMMENDATION #1-21 Crash Crane Jettison Attachment

A bulldozer-type blade be developed for installation on the flight deck crash crane to aid in the jettisoning of aircraft from carrier flight decks. Proposed cognizance: NAVMAT

RECOMMENDATION #1-22 Damage Control Equipage Allowance

The FORRESTAL and ORISKANY fires be analyzed to determine a more suitable and more adequate allowance for OBAs, canisters, foam, fire extinguishers, hoses and other damage control equipment than now specified for CVAs. Proposed cognizance: NAVMAT

RECOMMENDATION #1-23 Funding For Damage Control Equipment

Damage control equipment aboard carriers be funded from an account separate from the ship Operating Target (OPTAR) in order to avoid having safety equipment compete with all other ship upkeep items for the limited funds available. Proposed cognizance: NAVMAT

RECOMMENDATION #1-24 (b) (3) (A) [redacted]

(b) (3) (A) [redacted]

Proposed cognizance: NAVMAT

RECOMMENDATION #1-25 Ballasting Requirements

A technical review be made to insure the adequacy of CVA liquid loading instructions, and systems available to remove sea water from JP-5 and RSEC stored in ballast tanks. Deficiencies in individual ships discovered in this review should be the subjects of Ship Alterations. Proposed cognizance: NAVAIR

RECOMMENDATION #1-26 Escape Criteria

Criteria be established to require two means of egress from berthing and working spaces which may be occupied by ten or more men. Where feasible, Shipalts should be issued to meet these criteria in existing ships. Proposed cognizance: NAVAIR

RECOMMENDATION #1-27 Battle Dressing Station Accessibility

Criteria be established to insure that litter cases can be transported into Battle Dressing Stations and Sick Bay, and that Shipalts be issued to correct deficiencies on existing ships. Proposed cognizance: NAVSAT

RECOMMENDATION #1-28 Aircraft Jettison Locations

Individual carrier flight decks be surveyed to determine the best locations for jettisoning aircraft so that damage to sponsons or equipment is minimized. Proposed cognizance: NAVSAT

RECOMMENDATION #1-29 Survey of CVA Accidents

A technical damage report similar to "A Survey of Carrier Accidents, 1951-1967" which was prepared for the Panel by a member of the staff of the Marine Engineering Laboratory, be published for each significant incident involving damage to a CVA/CVS (a significant incident is defined as one which necessitates an immediate return of the ship to a shipyard or repair facility) for distribution to the fleet so that every carrier is furnished a case history of all major disasters. Work started on the aforementioned paper should be continued in order to develop a complete record of past incidents. Proposed cognizance: NAVSAT

RECOMMENDATION #1-30 Improved Fire Pump Performance

The reliability and performance of carrier fire pumps be improved by the application of recent technological developments in sea water resistant submarine materials. Proposed cognizance: NAVSAT

RECOMMENDATION #1-31 Fire Fighting Symposium

To focus attention on the importance to the Navy of the subject, Navy-Industry symposia be sponsored on the prevention of fire and explosion

RECOMMENDATION #1-31 (Cont'd)

and on fire fighting. National Security Industrial Association, American Ordnance Association, Bureau of Mines, etc., are suggested as participants. Proposed cognizance: NAVAIR

RECOMMENDATION #1-32 Control Station Design

An analysis be conducted of critical control stations aboard carriers such as catapult control, arresting gear control, damage control, aviation weapons movement control, primary fly, hangar bay conflagration control, and fog foam stations to determine their suitability from the aspects of human engineering and that habitability, display , and communication deficiencies be corrected. Particular emphasis should be placed on functional communication, standard displays, and error-proof controls. Proposed cognizance: NAVAIR

RECOMMENDATION #1-33 Conversion of the Aviation Gasoline System to Fire Fighting System

The feasibility be investigated of converting the high capacity aviation gasoline system to a fire extinguishing system (with light water for example) upon the phase-out of aviation gasoline aboard carriers. Proposed cognizance: NAVAIR

RECOMMENDATION #1-34 Ship Survivability

A broad exploratory development program be established aimed at the improved survivability of major ships. The program should be carefully oriented toward end products; for example, special attention should be given to attack aircraft carrier flight deck operations, fire fighting and damage control improvements, etc. Establishment of a lead laboratory charged with the responsibility for developing damage control concepts with new facilities including simulated flight decks, methods for evaluating fire fighting hardware, potentialities for developing ordnance handling methods, etc., should be considered. Proposed cognizance: NAVAIR

RECOMMENDATION #1-35 CVA Computer Model

The application of computer techniques to CVA problems be investigated. Through such techniques one might optimize relative safety versus operational aspects of the CVA system as a defended, mobile, forward floating air base through the use of a computer simulation model incorporating rates of launching, recovery, rearming, and relaunching with changes in method, manning, and equipment for breaking out and striking down ammunition and the like. Proposed cognizance: OPNAV

J. Ship's Material (Cont'd)

RECOMMENDATION #1-36 Habitability Improvements

Habitability items such as mattresses, curtains, deck and bulkhead coverings, furniture, paint and the like, be reviewed to insure that materials of minimum flammability are selected to serve their intended purpose. Air conditioning is considered a prime and very necessary habitability item, but it should be installed with due consideration for facility of establishing fumetight, airtight, or watertight boundaries within the ship. Proposed cognizance: BAVSHIP

2. Personal Equipment

RECOMMENDATION #2-1 Current MK-V Mask Capabilities

Information be promulgated throughout the fleet setting forth the capabilities and limitations of the MK-V Protective Mask ("gas mask") as an escape breathing device in its present configuration. Proposed cognizance: NAVSEA

RECOMMENDATION #2-2 OBA Training Canisters

Oxygen Breathing Apparatus training canisters be procured in quantities to satisfy fleet training requirements. Proposed cognizance: CNET, NAVSEA

RECOMMENDATION #2-3 Emergency Breathing Apparatus

In order to enhance personnel survival during emergencies:

a. The MK-V Protective Mask be adapted as an escape breathing device as well as a "gas mask" through the addition of a small portable air supply. Air supply fittings should be compatible with those found on the Full View Emergency Air Line Mask now employed on submarines to permit connection to ship's service air supply through appropriate filters.

b. The MK-V Protective Mask (or its successor) carrying container be redesigned to function as a shipboard disaster survival kit with compartments for mask, emergency air supply, flashlight, gloves, knife, etc.

c. Full View Emergency Air Line Masks be installed in critical watch stations such as pump rooms, shaft alleys, steering gear rooms, and emergency generator rooms, where continued manning during a disaster is essential or where access is limited and may be blocked by fire or water.

d. Banks of charged air flasks be located in compartments where suitable ship service air is not available. Proposed cognizance: NAVSEA

RECOMMENDATION #2-4 Identification of Damage Control Leaders

A distinctive device(s) in the form of a badge, helmet, jersey or brassard be provided for damage control party leaders and that such identification be standardized throughout the fleet.

RECOMMENDATION #2-5 SRC-22 (MICKEY MOUSE) For Ordnance Personnel

An allowance be established to provide Aviation Ordnance Officers and Explosive Ordnance Disposal Officers with SRC-22 (Mickey Mouse) headsets to permit them to communicate with the Air Officer during emergencies which may require rapid downing of aircraft. Proposed cognizance: CNAV

2. Personal Equipment (Cont'd)

RECOMMENDATION #2-6 Flight Deck Personnel Equipment

The responsibility for the development and procurement of flight deck personnel equipment be consolidated at the Naval Air Systems Command and a program be initiated to develop the protective and survival equipment required by the unique and demanding environment presented by carrier deck operations. Proposed cognizance: NAVAIR

RECOMMENDATION #2-7 OBA Improvement

A program be established to improve the oxygen breathing apparatus (OBA) by employing latest materials and techniques to reduce the size, simplify operation, and extend canister life. Proposed cognizance: NAVAIR

RECOMMENDATION #2-8 Improved Proximity Suit

An improved proximity rescue suit, including boots be procured for Hot Suit Men of Carrier and Field Crash and Salvage Crews, these improvements to include resistance to tear and abrasion, reflection of heat, and increased flexibility. Proposed cognizance: NAVAIR

3. Aircraft Systems

RECOMMENDATION #3-1 Improved Survivability of Aircraft

A program be initiated to test and, as feasible, retrofit U.S. Navy combat aircraft with components of the BFGD Corporation proposals for improvement of aircraft survivability; these proposals include the use of reticulated foam fillers for fuel tanks and ABX-24 material for puncture resistant fuel cells. Proposed cognizance: NAVAIR

RECOMMENDATION #3-2 Bomb Hook Pin Requirements

Instructions be issued to eliminate the present bomb hook pin requirements for the MER/TER racks on the flight deck and substitute procedural steps in bomb loading to insure mechanical locking of the bomb hooks when bombs are loaded. Proposed cognizance: NAVAIR

RECOMMENDATION #3-3 Rack Safing Devices

A Tentative Specific Operational Requirement be established for aircraft bomb racks which specifies a single safing device for both mechanical and electrical safing. The device should be integral with the rack. Proposed cognizance: OPNAV

RECOMMENDATION #3-4 Weapons Handling Equipment

Weapon handling equipment, both manual and hydraulic assisted, should be developed for use on carrier flight and hangar decks. Principles of safety and human engineering should be of prime consideration. Proposed cognizance: NAVAIR

RECOMMENDATION #3-5 AERO 12A Bomb Skid

The present Aero 12A bomb skid strap buckle be redesigned to provide reliable security. Proposed cognizance: NAVAIR

4. Weapons (Cont'd)

RECOMMENDATION #4-8 Pre-Belted 20 MM Ammunition

20 MM ammunition be pre-belted at shore activities in order to reduce ammunition assembly line and handling aboard CVAs. This pre-belted ammunition should be outloaded with HERO shields in place. Proposed cognizance: NAVAIR

5. Training

RECOMMENDATION #5-1 Air Wing DC/Fire Fighting Training

Air wing personnel receive fundamental training in basic damage control and ship disaster survival prior to embarkation for deployment. Proposed cognizance: OPNAV

RECOMMENDATION #5-2 Fleet Damage Control Training Facilities

Fire-fighting and damage control training facilities be expanded to meet Fleet needs. New methods such as mobile teams and mobile trainers should be investigated to meet CVA needs for this training at locations in proximity to the ship. Proposed cognizance: BUPERS, LANTFLT, PACFLT

RECOMMENDATION #5-3 Damage Control Training of Carrier PCO's

Prospective commanding officers of CVAs be required to complete a course in damage control prior to assuming command. The course should include basic principles of ship damage control, a review of past carrier incidents and damage reports, including combat damage, and observation of and participation in actual fire fighting and damage control training exercises. Proposed cognizance: OPNAV, BUPERS, FLEET COMMANDS

RECOMMENDATION #5-4 Certification of Ordnance Personnel

Ordnance personnel be individually certified in writing as being qualified to assemble, load, arm, disarm or download individual items of munitions, and that this qualification be demonstrated periodically before a command instituted board to maintain certification. Only certified personnel should be authorized to conduct evolutions with air launched weapons and pyrotechnics. Proposed cognizance: OPNAV

RECOMMENDATION #5-5 En Route Training For Enlisted Personnel

Enlisted personnel receive specialized training including environmental and survival training for first term personnel while en route to CVAs, rather than during the carriers' training and work up periods. Proposed cognizance: BUPERS

RECOMMENDATION #5-6 Weapon Training Devices

Requirements be established for the procurement of inert weapons and weapon training devices, and that these devices be delivered in advance of the introduction of the associated weapon into the Fleet. Proposed cognizance: NAVMAT

5. Training (Cont'd)

RECOMMENDATION #5-7 Increased Emphasis on Damage Control

Increased emphasis be given to damage control training throughout the Navy, including OCS, NROTC, U.S. Naval Academy, and the Naval Air Training Command. Proposed cognizance: BUPERS

RECOMMENDATION #5-8 Training Aids

Improved training aids for damage control (including a film on the USS FORRESTAL fire prepared from the available PLAT and hand-held camera footage) be prepared and provided to all CVAs. Proposed cognizance: OPNAV, NAVMAT

6. Documentation

RECOMMENDATION #6-1 CVA Munitions Load-Out Certification

The certification of air launched weapons for shipboard use and the authorization for individual carriers to load and employ specific weapons be formalized by the publication of a Weapons Stowage and Handling Manual which shall be updated as required to provide for the introduction of new weapons. Proposed cognizance: NAVMAT

RECOMMENDATION #6-2 Handbooks

Advanced handbook technology including standardized format, symbology, and terminology be utilized in the preparation of aircraft and weapon manuals to meet the environmental conditions of fleet use. Proposed cognizance: NAVMAT

RECOMMENDATION #6-3 Weapons Damage Control Procedures

Safety procedures and damage control considerations for each weapon be established and promulgated with weapons handbooks. Proposed cognizance: NAVMAT

RECOMMENDATION #6-4 Safety Requirement in Technical Development Plan (TDP)

The instructions governing the preparation of Technical Development Plans (TDP) be modified to require a mandatory safety program for all weapons developments, and that any departure from the approved TDP safety progra be authorized in writing by OPNAV. Proposed cognizance: OPNAV, NAVMAT

RECOMMENDATION #6-5 Aviation Ordnance Accident/Incident Information

Aviation ordnance accident incident information be published to the fleet by the Naval Aviation Safety Center (NAVAVSAFCEN) in existing aviation safety publications for the purpose of apprizing the fleet of possible ordnance problems. Proposed cognizance: OPNAV, LANTFLT/ PACFLT

7. Personnel

RECOMMENDATION #7-1 CVW/Squadron Aviation Ordnance Officers

Limited Duty Officers (LDOs) and Warrant Officers (WOs) with aviation ordnance background (instead of electronics, for example) be assigned to fleet units on a relative priority system, with Attack Carrier Air Wing Staff Ordnance Officer billets being filled first and subsequent assets equitably distributed to provide 50%, or more, of the Squadron Ordnance Officer billets within any given air wing with such specialists. Proposed cognizance: BUPERS

RECOMMENDATION #7-2 Increased Allowance for DC and EOD Supervisory Personnel

The allowance of damage control and explosive ordnance disposal supervisory personnel for CVAs be increased as follows:

	Present	Proposed
Warrant Carpenter	1	2
Damage Control CPO	2	4
Explosive Ordnance Disposal Officer	1	1
Explosive Ordnance Disposal Petty Officers	2	4

Proposed cognizance: BUPERS

RECOMMENDATION #7-3 Shore Duty Billets for Ordnance Personnel

Enlisted ordnance billets at Naval Weapons Centers, Naval Magazines and Naval Ammunition Depots be retained in order that enlisted personnel may work within their ratings while on shore duty. This will maintain personal expertise and enhance carrier safety in subsequent assignments. Billets are now undergoing civilian substitution. Proposed cognizance: OPNAV

RECOMMENDATION #7-4 Tour Length for CVA CO

Tour lengths of attack carrier commanding officers be extended to about eighteen months to achieve greater command stability and continuity. Proposed cognizance: BUPERS

RECOMMENDATION #7-5 Human Performance Measurement

An advanced development project be established to determine measures and indices of human fatigue and performance decrement which can be used to predict human breakdown or risk of human error under operational conditions. Proposed cognizance: NAVMAT

8. Organization

RECOMMENDATION #8-1 Standard Fire Fighting Organization and Doctrine for CVAs

A standard fire fighting organization and doctrine be established for carriers, based upon the most successful fleet practice and experience, and that this organization and doctrine be prescribed in the AIRLANT/AIRPAC Instruction. Proposed cognizance: OPNAV

RECOMMENDATION #8-2 Responsibilities of Air Officer and Damage Control Assistant

Battle Control (NWP 50-1(B)) be revised to define the operational authority and responsibility of the Air Officer and his assistants with regard to fire fighting on flight and hangar decks, with particular attention to the interfaces with Damage Control Assistant (DCA). Proposed cognizance: OPNAV

RECOMMENDATION #8-3 Duties of Crash and Salvage Crews

Procedures of the Air Department of aircraft carriers be revised so as to eliminate the practice of requiring members of the Crash and Salvage Crew to operate tow tractors during start, launch, and recovery operations. Proposed cognizance: LANTFLT/PACFLT

RECOMMENDATION #8-4 Condition Zebra During General Quarters

Battle Control (NWP 50-1(B)) be revised to reflect the access requirements of aircraft maintenance personnel during general quarters, thus determining a realistic number of ZEBRA closures which may remain open for servicing aircraft. The requirements for a material condition to be set when the ship is at flight quarters, but not at general quarters, should also be specified in NWP 50 1(B). Proposed cognizance: OPNAV

RECOMMENDATION #8-5 Hazardous Material Control

A central group be established for the dissemination of information, monitoring of research efforts, and furnishing rapid response to the Fleet on matters concerning the identification, control, handling and stowage of dangerous materials aboard ship. Further, that an informal newsletter which discusses these materials be published on a monthly basis and be similar in format to the Aviation Safety Bulletin. Particular emphasis should be placed on the behavior of materials, commonly considered safe, when they are subjected to special environments (including fires) that may be encountered aboard ship. The publication should be designed to keep Commanding Officers, Executive Officers, Engineer Officers, and their subordinates, well informed. Proposed cognizance: NAVMAT

RECOMMENDATION #8-6 Human Factors Program

An effective Human Factors Program be established at all NAVAIR levels, including laboratories and field activities, to insure that systems are designed for efficient operation by Naval personnel. Proposed cognizance: NAVAIR

RECOMMENDATION #8-7 Damage Control Training Assistance

Damage control assistance teams under the control of the Air Type Commanders, conduct periodic visits to deployed carriers to evaluate damage control readiness and provide training assistance. Proposed cognizance: LANTFLT/PACFLT

RECOMMENDATION #8-8 Ordnance Safety Observers

Ordnance Safety Observers be temporarily assigned to each Seventh Fleet CVA during the carrier's first combat operating period of the deployment, to observe ordnance handling and to advise the commanding officer of unsafe practices. Proposed cognizance: PACFLT

9. Operations

RECOMMENDATION #9-1 CVA Damage Control Training Requirements

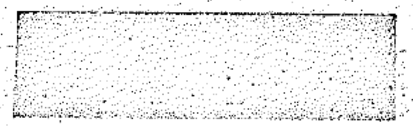
The Standard Training Requirement Manual for carriers be revised to require, in addition to exercises graded for the competitive cycle, a minimum of one general quarters drill per week at sea, and a prescribed minimum of supervised fire drills at sea or in port. Proposed cognizance: OPNAV

RECOMMENDATION #9-2 Ship Maneuvering During Fires

A treatise be prepared on the subject of maneuvering a carrier during fires or explosions to minimize damage and facilitate fire fighting and damage control measures. Because of the large number of factors which can be involved, this treatise should be in the form of a discussion of these many considerations and the possible effects of the different courses of action available to the conning officer. Proposed cognizance: OPNAV

RECOMMENDATION #9-3 CVA Deck Multiple

Fleet commanders review assigned CVA deck multiples to assure that they are realistic from the standpoint of safety of operations. Proposed cognizance: LANT FLEET/PAC FLEET



SECTION VII

IMPLEMENTATION

SECTION VII -- IMPLEMENTATION

A. Shortly after the Panel to Review Safety in Carrier Operations was convened, the Director, in a memorandum to the Chief of Naval Operations dated 20 August 1967, stated "We would hope that the deliberations of our Panel will in no way delay the initiation of measures by yourself and other responsible persons in the Navy which in your collective good judgment will improve safety. We are aware of certain measures already begun..." Of these measures referred to in the Director's memorandum as having already begun, some were completed, or action thereon was well underway by the time the Panel commenced the actual formulation of their recommendations. Therefore, the Panel did not include in this report recommendations which would accomplish these same measures. However, it is appropriate that an accounting of those actions already accomplished be contained in this report. The following is a catalogue of such items. Some were initiated on the basis of a preliminary recommendation made by the Director, others were undertaken independently.

1. Twin Agent Fire Trucks for CVAs. The Deputy Chief of Naval Operations (Air) has taken action to provide three Light Water and Purple K fire trucks for each WestPac CVA. These trucks are now being delivered.

2. Test of Nuclear Washdown System. It was recommended by the Director in NAVBASE Subic message 010132Z September 1967 that the nuclear washdown system of ships be used to fight flight deck fires and that it should be tested during the next inport period. COMNAV-AIRPAC message 021855Z October 1967 reported the results of tests of the ENTERPRISE washdown system.

3. LAU 10 Shorting Device. CNO message 131715Z September 1967 alerted fleet commanders to certain dangerous material discrepancies in conventional air launched weapon noted by the Panel during their visit to CVAs operating at Yankee Station. The LAU 10 shorting device corrosion problem was addressed as one of the items of concern. NAVAIRSYSCOM message 121610Z September 1967 assigns as F4B to the Naval Air Test Center to investigate the "RADHAZ safe features of the LAU-10/A launcher". In addition, Interim Armament Bulletin 407 was published to correct pod deficiencies. New production LAU 10s have a new shorting device installed.

4. Purple K in CVA Fire Fighting. CNO message 052128Z October 1967 to the Chief of Naval Material recommended that each aviation ship be given a suitable allowance of hand-held Purple K fire extinguishers. This was in response to a Panel recommendation to the Deputy Chief of Naval Operations (Air).

B. It has been observed that a number of actions have already been initiated to improve safety in carrier operations which are similar to those recommended by the Panel. In order to support these independently generated efforts it was decided that those recommendations generated by the Panel for which action had been initiated, but not completed, would be incorporated in this report. Listed in the following are recommendations upon which, in the knowledge of the Panel, some action has already been taken. The status of this action is summarized in each case.

RECOMMENDATION #1-1 -- Advanced Flight Deck Fire Fighting System

The Chief of Naval Operations in CNO Confidential message 161649Z August 1967, Subject: CVA Conflagration Control System (U), directed the Chief of Naval Material to design, on an urgent basis, a flight deck fire extinguishing system. The Commander, Naval Ship Systems Command in NAVSHIPSYSCOMHQ Confidential message 052218Z October 1967 to the Chief of Naval Operations, Subject: CVA Conflagration Control (U), reported that an effective remotely operated system would require one to two years to develop and test. The cost is estimated to be $2M to $4M per ship.

RECOMMENDATION #1-2 -- Purple K/Light Water System

The Chief of Naval Operations in CNO Confidential message 052126Z October 1967, Subject: CVA Fire Fighting Systems (U), requested the Chief of Naval Material to conduct tests of the hand-held 30lb Purple K extinguisher on the flight deck of a CVA/CVS. In a personal memorandum from Captain Westmoreland (AIR 524) to the Director, Serial AIR-5345:AEW of 20 October 1967, a program to evaluate the installation of a Purple K dispenser in a H-2 helicopter was also described.

RECOMMENDATION #1-3 -- Washdown Countermeasures System

The Chief of Naval Operations in CNO Confidential message 152300Z September 1967 to the Chief of Naval Material, Commander-in-Chief, U.S. Pacific Fleet, and Commander-in-Chief, U.S. Atlantic Fleet, Subject: Flight Deck Conflagration Control (U) concurred in the use of the washdown countermeasures system as an interim solution to the flight deck fire fighting problem. In NAVSHIPSYSCOMHQ Confidential message 042047Z October 1967, Subject: Flight Deck Conflagration Control, the Commander, Naval Ship Systems Command authorized the Norfolk Naval Shipyard to commence planning for the installation of bomb farm sprinkling in FORRESTAL. The Commander Naval Ship Systems Command in NAVSHIPSYSCOMHQ Confidential message 052218Z October 1967 to the Chief of Naval Operations, Subject: CVA Conflagration Control, reported progress on a flight deck fire fighting system. Although NAVSHIPS expressed belief that the washdown countermeasures system may be ineffective in a fire, it stated that the sprinkling of bomb farms would be installed on an urgent basis. In NAVSHIPSYSCOMHQ Confidential message 062232Z October 1967 to the Chief of Naval Operations, the Commander, Naval Ship Systems Command estimated the cost of installation of bomb farm sprinkling to be $3.5 million.

RECOMMENDATION #1-5 -- Improved Roaming Rates Project

A Program Change Request has been submitted for additional O&MN funds to support the program in Fiscal Year 1969. This was confirmed in a telephone conversation between Captain Strayve and the action officer in Op-34.

RECOMMENDATION #1-17 -- CVA HERO Survey

The Chief of Naval Material in CNM Confidential message 222116Z September 1967 to the Commander-in-Chief, U.S. Pacific Fleet, Subject: HERO Problems, stated that immediate assistance would be rendered to conduct HERO surveys. The Commander Naval Air Forces, Pacific in Confidential message 040105Z October 1967, Subject: Flight Deck HERO Survey (U), established a schedule for these surveys.

RECOMMENDATION #1-26 -- Escape Criteria

The Commander, Naval Ship Systems Command in his Fifth Endorsement, Serial 522H-870 of 13 September 1967, on the Formal Board of Investigation report on the ORISKANY fire, stated that SHIPALTS were being issued to provide alternate escape exits from working, berthing and living spaces on CVA/CVS type ships.

RECOMMENDATION #1-32 -- Control Station Design

Captain Strayve and Commander (b) (6) (Panel Members) have knowledge of the following efforts now in progress:

a. The Integrated Catapult Control Station development and test program is now in progress at the Naval Air Engineering Center, Philadelphia.

b. Naval Air Engineering Center, Philadelphia is conducting an on board survey of Primary Fly Controls with a view toward developing a standard for these installations.

RECOMMENDATION #2-3 -- Emergency Breathing Apparatus

The Chief of Naval Material (MAT 0442) has advised Captain Strayve that by a letter to the Chief of Naval Operations, the Chief of Naval Material will endorse the proposal to modify the Mark V Protective Mask and recommend development of a new emergency breathing apparatus.

RECOMMENDATION #3-1 -- Improved Survivability of Aircraft

The Chief of Naval Operations in CNO Confidential message 051321Z October 1967, Subject: Combat Induced Aircraft Fires, directed the Chief of Naval Material to investigate the feasibility of utilizing reticulated foam as a filler for aircraft fuel cells and improved materials in tank fabrication.

RECOMMENDATION #3-2 -- Bomb Hook Pin Requirements

A member of the Commander Naval Air Forces, Pacific staff advised Panel member Cdr (b) (6) by telephone on 10 October 1967, that a study directed toward reducing reqtrd MER/TER safing pins was being conducted at Naval Weapons Evaluation Facility, Albuquerque.

RECOMMENDATION #4-2 -- In-Line Explosive Train Fuzes

The Commander Naval Air Systems Command in a letter AIR-53233-D:LAM Serial 07246 of 2 October 1967, recommended to the Chief of Naval Operations that many of the fuzes listed in the Panel Recommendation be declared obsolete.

RECOMMENDATION #4-3 -- MK 36 Destructor

The Chief of Naval Operations in CNO Confidential message 131715Z September 1967, Subject: Safety of Air Launched Weapons (U), directed the Chief of Naval Material to take action to improve safety. Naval Ordnance Laboratory, White Oak is already taking action.

RECOMMENDATION #5-1 -- Air Wing EC/Fire Fighting Training

Commander Naval Air Forces, Pacific in COMNAVAIRPAC INSTRUCTION 01500.1J established minimum fire fighting requirements for Air Wing personnel.

RECOMMENDATION #5-2 -- Fleet Damage Control Training Facilities

Commander Naval Air Forces, Pacific Confidential message 122229Z October 1967, in response to Commander-in-Chief Pacific Fleet Confidential message 232043Z September 1967, Subject: Fire Fighting Training for Air Wing/Group Personnel, requested Chief of Naval Operations approval and funding to establish fire fighting schools at NAS Miramar, NAS Lemoore, NAS Whidbey and NAS North Island.

RECOMMENDATION #5-8 -- Training Aids

The Chief of Naval Operations in CNO message 112035Z September 1967, states that, if suitable, a training film utilizing FORRESTAL footage will be expeditiously produced and distributed. Production is proceeding.

RECOMMENDATION #6-4 -- Safety Requirement in Technical Development Plan (TDP)

The Chief of Naval Material reported in a memorandum, MAT-016/299 Serial 04077 of 6 October 1967, Subject: Progress Report on Review of Ordnance Safety Relating to Carrier Operations (U), that the Naval Ordnance Systems Command is preparing an instruction establishing a Safety Design Board to review weapons designs prepared by all Systems Commands and requiring that safety plans be incorporated in all weapons system TDP's to insure that explosive safety is designed into weapons systems.

RECOMMENDATION 68-5 -- Hazardous Material Control

The Chief of Naval Material established a Hazardous Materials Study Group in May 1967 (stated during Briefing to Panel by (b) (6) (b) (6), Code NavSec 6101C, on 20 September 1967) directed toward a study of marking, handling, transfer, and storage of hazardous materials aboard ship.

ANNEX A -- RATIONALE FOR RECOMMENDATIONS

RECOMMENDATION #1-1 Advanced Flight Deck Fire Fighting System

A program be established to develop an advanced flight deck fire fighting system. Features of this system should include: remote control, massive and quick response, cooling for ordnance, sufficient redundancy to compensate for derangement of portions of the system, sufficient flexibility to cover all spotting conditions, compatibility with portable fire fighting systems and rescue devices. An important corollary which should be included in this priority is a means for quick drainage or dispersal of large quantities of spilled fuel from the flight deck. Consideration should be given to recent developments in chemical extinguishing agents and fire fighting devices. Development and evaluation of competitive designs should be encouraged. Proposed cognizance: NAVMAT

RATIONALE:

1. Development of an advanced flight deck fire fighting system is of prime importance. Principal attention in aircraft carrier fire fighting has been focused in the past on the hangar deck. Adoption of the steel ballistic deck in MIDWAY Class and later carriers, and the trend toward elimination of aviation gasoline, tended to support the belief that control of fire on the flight deck was not a serious problem. The FORRESTAL incident proved that it is.

2. Modern carrier aircraft are capable of carrying large quantities of fuel and weapons. The strike group on FORRESTAL was estimated to be loaded with approximately 40,000 gallons of JP-5 when the accident occurred. Modern aircraft and weapons complexities combine with environmental conditions on a flight deck to provide an ever present possible source of ignition. Presently installed equipment is not capable of handling a conflagration of the magnitude of that which developed on FORRESTAL. (FORRESTAL Investigation) Equipment is manually operated, consequently not suitable for use in an environment where munitions are exploding. Also, manual operation makes response time too long. Finally, age and inadequate maintenance have further degraded system performance. (COMTRALANT briefing)

3. There are many promising new materials and devices which should be considered in the design of the advanced system. Some of these are:

a. Purple K/Light Water, Purple K/Compatible Foam and Purple K/Light Sea Water which can be dispensed by several methods both fixed and portable.

b. Fixed Dry Powder Injection Systems which can be activated remotely to dispense chemicals automatically into a conflagration.

RECOMMENDATION # 1-1 RATIONALE: (Cont'd)

c. Fire monitors which can be mounted in the island or along the edges of the flight deck. Those on the deck edge would pop up under hydraulic pressure and be operated remotely by personnel using periscopes or mirrors.

d. Chemical extinguisher bombs which can be dispensed from a helicopter.

e. High Expansion Foam which may be effective provided expansion ratios are not too great (100:1 or less).

f. Pop-up deck mounted spray nozzles which may be selectively controlled from remote locations.

g. Vacuum cleaner like devices which can rapidly drain spilled fuel from the deck.

h. Special chemicals which when applied render jet fuel inert.

There is no reason to believe any single material or device will provide a complete solution. It is more likely that combinations of devices and materials will be required.

4. Some design objectives which should be considered for this system are:

a. Control of fixed installations to be available in Pri Fly and the Bridge and permit selective operation of segments of system, or, alternatively, total coverage.

b. Response to be such that system reaches full effectiveness in no more than ten seconds.

c. System should be able simultaneously to extinguish fuel fires and to cool ordnance hanging from aircraft, resting on bomb skids, or lying on deck.

d. Sufficient redundancy should be provided to compensate for loss of portions of the system due to enemy or other action.

e. System must not restrict the movement of aircraft on flight deck nor require installations which, when not in use, exceed the maximum heights prescribed in the General Specifications.

f. Routine checkout of system, to insure proper operation, should be feasible without damaging flight deck installations or aircraft.

g. System should be compatible with portable fire fighting systems which may be utilized concurrently to fight fires.

RECOMMENDATION #1-1 RATIONALE (Cont'd)

h. Rescue or evacuation of pilots and flight deck personnel should not be unduly impeded by system activation.

i. Rapid drainage or dispersal of large quantities of spilled fuel.

5. Briefings and visits by the Panel, as well as personal contacts by Panel members, support the conclusion that there is within the Naval Establishment a great deal of expertise in fire fighting. This capability, if brought to bear in a coordinated program, could most certainly produce a satisfactory solution to this problem.

RECOMMENDATION #1-2 Purple K/Light Water System

The Purple K/Light Water fire-extinguishing equipment be utilized in carriers to the maximum extent commensurate with its inherent capabilities. Areas to be investigated should include: an improved fire fighting vehicle, helo-borne equipment, fixed dispensing systems, applications in the form of a bomb or grenade, and wider use of hand-held extinguishers. Tests should be conducted to demonstrate the effectiveness of the system in the flight deck environment (i.e., high winds and turbulence). Developmental efforts to make the system compatible with sea water should receive increased emphasis. Proposed cognizance: NAVMAT

RATIONALE:

1. The use of Purple K Powder and Light Water, both in combination and in separate applications, has been greatly expanded in recent months, but the Panel considers the full potential of these agents has not yet been exploited.

2. The Panel witnessed a demonstration of the effectiveness of the Purple K/Light Water vehicle, now being deployed aboard CVAs in SEASIA, during a visit to the Naval Research Laboratory. The results were impressive. A large gasoline fire (20'X40' approximately) was extinguished in a matter of 30 seconds. Dr. (b) [redacted], of the Naval Research Laboratory indicated that this system is 5 to 12 times as effective as present protein foam. At the San Diego Fleet Training Center Fire-fighting School the Panel observed a demonstration of the effectiveness of Purple K alone. Here a dry extinguisher was used on a JP-5 fuel fire with almost instantaneous effect.

3. The present program is to provide each of the carriers on station in SEASIA with three vehicles carrying Purple K/Light Water. If these units prove to be satisfactory, the program will be expanded to include all CVAs. Purple K dry powder extinguishers are now in use in machinery spaces and in galleys on CVAs. (Damage Control Systems in CVA 67 and CVAN 68 briefing by NAVSHIPS)

4. One disadvantage in the use of the Purple K/Light Water system aboard ship is the requirement that fresh water be used. (NRL briefing by Dr. (b) (6)) It is conceivable that the container of fresh water may be depleted before the fire is extinguished. Research is presently underway to develop a system employing Purple K with light sea water. (NRL briefing by Dr. (b) (6)) A second disadvantage of Purple K is its incompatibility with existing high protein foam. Development is underway (Applied Science Laboratory Report DDCAD/489060) to produce a compatible foam. Strong emphasis should be continued on both of these projects. Finally, the evaluation of the

RECOMMENDATION #1-2 RATIONALE: (Cont'd)

effectiveness of Purple K/Light Water system has not been accomplished under simulated flight deck conditions, (i.e., high wind velocity and turbulence). It is possible that the Purple K/Light Water will be ineffective in high winds, and it may be necessary to use a heavy foam with Purple K to assist in its application and to form a heavy blanket to prevent re-ignition. In the FORRESTAL fire an attempt was made to extinguish the fire with a Purple K bottle. The films of the fire show that in this case, though the Purple K appeared to be effective, the hand-held bottle was inadequate to cope with a fire of this magnitude.

5. There is a program to evaluate a helicopter borne version of the Purple K/Light Water system. This was described in both the briefing at NRL by Dr. (b) and in a panel briefing on flight deck equipment by Cdr (b) (6) NAVAIR 534.

6. Other suggested uses of dry powder such as Purple K have been:

a. Chemical extinguishing bombs which may be carried aloft by aircraft and dropped in the fire.

b. Fixed dispensing systems which inject the powder into compartments.

7. The demonstrations of the Purple K/Light Water and Purple K alone were sufficient to convince the Panel that programs should proceed to make maximum use of these new materials in shipboard applications.

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RECOMMENDATION #I-3 Washdown Countermeasures System

Conflagration control on the flight deck be provided through the use of the Washdown Countermeasures System. Modifications which will be required include remote control from Pri Fly or the Navigating Bridge and replacement of all plastic pipe with metal pipe. In addition, sprinkling for the areas outboard of the island and on sponsons where ready service weapons are stowed should be installed. Augmentation of existing fire pump capacity may prove necessary in order not to degrade existing fire-fighting system capability. Proposed cognizance: NAVMAT

RATIONALE:

1. Present flight deck fire fighting systems, High Capacity Fog Foam and portable Dry Powder extinguishers, cannot control a large scale fire such as occurred in FORRESTAL (FORRESTAL Investigation Report). Bomb cook off tests as described at the NML Dahlgren briefing and the PLAT film of the FORRESTAL fire combine to indicate that some ordnance will explode high order in as short a time as 90 seconds. Because of the tempo of operations and limitations on weapons handling facilities, ships must stow ready service weapons topside. Favored spots are on the flight deck outboard of the island and on sponsons adjacent to the hangar.

2. A measure of conflagration control may be available in ships so configured through use of the washdown countermeasures system. The water from this system could be employed to cool ordnance and sluice away burning fuel. Protection for the bomb farms could be readily provided by installing spray heads and piping supplied from the fire main.

3. The following ships have permanently installed washdown countermeasure systems:

USS CORAL SEA (CVA43)

USS ORISKANY (CVA34)

USS INDEPENDENCE (CVA62)

USS KITTY HAWK (CVA63)

USS CONSTELLATION (CVA64)

USS ENTERPRISE (CVAN65)

USS AMERICA (CVA66)

USS J. F. KENNEDY (CVA67)

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RECOMMENDATION #. . RATIONALE (Cont'd)

The flight deck installation on CVA64 consists of spray type nozzles mounted flush in the deck and along the walkways. In addition, solid stream nozzles spray water over the section of the deck composed of heavy ballistic plating where flush type nozzles are not installed. This system will discharge approximately 12,000 gallons per minute. (CVA 64 Ship Information Book) As was indicated in NAVSHIPS 052218Z Oct 67, this provides only about .06 gallons per minute per square foot of flight deck as compared with the .8 gallons per minute per square foot provided by the magazine sprinkling system or the .22 gallons per minute per square foot provided by the hangar system. The washdown countermeasures system is activated by 21 valves located in the gallery deck. During the WESTPAC visit, Panel members noted that the valves were not well marked and were located in inaccessible places. Plastic pipe is used in portions of the system but is not suitable for the flight deck environment. During the WESTPAC visit, Panel members observed that it had been warped by jet blast and broken by flight deck crews moving in and out of the catwalks.

4. Ships are reluctant to activate and test the water washdown system because of the deleterious effects of salt water on aircraft, catapults and other flight deck installations. (Damage Control Ready or Not briefing by CDR (b) (6)). Consequently, ships personnel were unfamiliar with its operation. It was found, however, that there are fittings on the dry side of the last stop valve thus making it feasible to connect fresh water hose to the systems and flush out piping and spray nozzles.

5. Installation of spot-air conditioning, electronics cooling and additional sanitary facilities, together with system degradation due to age and inadequate maintenance, has resulted in a reduction in fire main pressure on the older ships (Panel WESTPAC visit to operating carriers) (Damage Control briefing by CDR (b) (6)). This condition impedes effective fire fighting on the flight deck. Activation of portions of the washdown countermeasures system should be feasible without impeding the use of High Capacity Fog Foam (HCFF) Stations, hangar sprinkling and magazine sprinkling.

6. It appears feasible to replace the existing activation valves for the washdown countermeasures system with valves suitable for remote operation (air or electrically operated). Controls for these valves as well as those which activate sprinkling over the bomb farms could be placed in both Pri Fly and the Navigating Bridge. The display would represent the flight deck and indicate areas covered by sections of the systems. Thus, the system could be selectively activated to apply water to a flight deck fire within a few seconds.

7. Although the washdown countermeasures system may prove to be a less than optimum flight deck fire fighting system, it has the following advantages:

RECOMMENDATION #1-3 RATIONALE (Cont'd)

a. Rapid response

b. Remote operation

c. Selectivity

d. Availability (On ships with permanent installations)

Therefore, a careful evaluation of this system during the current bomb cook off tests is indicated. Finally, the alterations suggested will enhance the system's availability and operability in the event of an NBC attack.

RECOMMENDATION #1-4 Hangar Bay Protection

The hangar bay conflagration protection system be further improved by utilizing the latest techniques in fire fighting, and fire detection. Proposed cognizance: NAVMAT

RATIONALE:

1. Although the hangar sprinkling systems proved to be effective in preventing the spread of fire and keeping ordnance cool in both the ORISKANY and FORRESTAL fires, (FORRESTAL and ORISKANY Investigation Reports) there are valid reasons for devoting resources toward improving these systems. The Panel members observed during the WestPac trip to carriers operating on YANKEE station that the hangars contained armed and fueled aircraft, bomb farms, and hazardous materials such as the many greases, solvents and lacquers used to maintain the aircraft. Although additional paint-mixing and ready issue rooms have been provided, these items were still found adrift. The hangar thus represents as potent a fire hazard as the flight deck. A hangar fire can cause serious damage to adjacent spaces as well as to parked aircraft. (FRANKLIN War Damage Report No. 56, ORISKANY Investigation Report, Survey of Carrier Accidents from 1951-1967 by [redacted], Marine Engineering Laboratory, NSRDC)

2. There are several factors which influence the methods used in fighting hangar fires. The hangar is divided by fire doors and hence can be mechanically separated into two or three bays, depending on the ship. The hangar boundaries contain closures which can be utilized to isolate a fire and eliminate the effects of wind. The hangar boundaries provide convenient attachment points for fire-fighting equipment, and finally, each hangar bay is provided with a manned conflagration-control station.

3. The aforementioned characteristics suggest the following areas of investigation for improving the fighting of hangar fires:

a. Use of smoke-, flame-, and heat-sensing devices to alert the conflagration control operator.

b. Furnishing the conflagration control operator with a Christmas tree display similar to that found on submarines which will indicate the status of all closures, and fire-fighting equipment.

c. Use of Purple K/Light Water stored in installed dispensing units.

d. Use of High Expansion Foam which is capable of completely filling a hangar bay in a short period of time.

e. Use of insulating materials such as intumescent paints on hangar boundaries to protect spaces adjacent to the hangar.

RECOMMENDATION #1-4 Hangar Bay Protection

RATIONALE: (Cont'd)

f. Use of localized extinguishing systems and drop curtains to cover special areas such as fueling stations, bomb farms, and fire-bomb preparation areas.

2. Systems which protect the hangar have performed satisfactorily in recent incidents. There are new state-of-the-art fire fighting materials, control systems, and insulating materials, however, which could be applied to further enhance hangar conflagration protection.

RECOMMENDATION #1-5 Improved Rearming Rates Project

Operations and Maintenance Navy (O&MN) Funds be budgeted for continuing the Improved Rearming Rates Project in attack carriers during their next overhaul periods. Proposed cognizance: OPNAV

RATIONALE:

1. The Improved Rearming Rates Project (IRRP) for attack carriers has the following objectives:

"a. To effect a major increase in aircraft rearming rate.

"b. To effect a major increase in weapon strikedown and strikeup rate, and

"c. To effect marked improvement in air-launched weapons handling and stowage throughout the logistics sequence." (Quoted from Technical Development Plan for Improved Rearming Rates (W11-13X) Third Revision 1 April 1967, Confidential)

2. These objectives, when met, will enhance safety aboard carriers in the following manner:

a. The large number of ordnance weapons stacked-up abaft the hangar deck during ordnance underway replenishment will be eliminated by the vastly increased strike-down capability.

b. The large bomb farms now imposed on flight and hangar decks during air strike operations will largely be eliminated by the increased strike-up and strike-down capability.

c. Through mechanization of the ordnance handling function, the necessity of utilizing large numbers of unqualified handling personnel will be eliminated and only ordnance personnel will be used.

d. The use of preloaded Multiple Ejection Racks (MERs) and Triple Ejection Racks (TERs) will permit faster arming of aircraft, thereby reducing the length of time ordnance is spread over the entire flight deck.

e. The below-decks central assembly line will afford improved control and supervision of the total-weapon assembly effort.

3. The present funding status of the IRRP is satisfactory in the Other Procurement Navy (OPN) and Research and Development (RDT&E) areas. However, funding in the O&MN area is approved only through FY 1968. O&MN resources should be obtained through FY 1972 to insure installation of the Project in all designated carriers.

RECOMMENDATION #1-6 Marking of Escape Routes

A standardized system of marking and lighting emergency escape routes in aircraft carriers be developed which is effective under conditions of very poor visibility caused by heavy smoke. Proposed cognizance: NAVMAT

RATIONALE:

1. The ORISKANY fire focused attention on the problems associated with escape from conflagrations aboard ship. In order to minimize and isolate structural damage, ships are compartmented to a high degree. The labyrinth thus created presents formidable obstacles to a man attempting to escape through darkened smoke-filled passageways and compartments. The size and organizational relationships of a carrier make it unlikely that each man will become familiar with all sections of the ship.

2. To help alleviate this condition, some ships have marked directions of egress by various methods; others have no markings.(USS CONSTELLATION ltr CVA 64/61/DSK 9160)(Panel visit to WEST PAC Carriers) To make the most effective use of escape training, and to assist personnel in escaping from smoke-filled compartments and passageways, a standard marking system should be made available.

3. As a result of the FORRESTAL fire, a recommendation was made to "identify 'dead end' spaces with large yellow letters on a black background" and "install blue lights at each access to the flight deck or hangar deck from the 01, 02, and 03 levels to provide easily recognized indicators of safe escape routes". (FORRESTAL Investigation Report) These recommendations indicate the urgent need to identify escape routes but do not necessarily specify the best method of marking these routes. Very little is known as to color or type of paints or lights that will be the most effective under the dense smoke conditions as experienced during the ORISKANY or FORRESTAL fires. Technical personnel investigating these problems seem, however, to agree that intermittent flashing lights may be the best for this purpose. This method offers promise for emergency lighting and therefore should be investigated.

RECOMMENDATION #1-7 Additional Bomb Jettison Chutes

Additional bomb jettison chutes be installed on the flight deck, with openings provided in deck coamings so that bombs may be rolled or pushed overboard without lifting. A hinged bar should be installed to close the flush entrance to the chute in order to preserve the function of the coaming against skidding aircraft. Proposed cognizance: NAVMAT

RATIONALE:

1. There is an urgent requirement to jettison exposed explosive ordnance during shipboard conflagration. During the WestPac visits to carriers operating on Yankee Station, Panel members observed a wide variance in the number, location, and types of bomb jettison chutes available to the crews of the ships visited. ORISKANY, having suffered a serious fire in 1966, was best equipped.

2. The FORRESTAL Investigation Report recommends, "Design and install large jettisoning slides at key places on the flight deck; specifically, both port and starboard forward, amidships and aft,..."

3. These chutes must be flush with the flight deck to permit rolling bombs freely over the side. A hinged bar should be placed in line with the flight-deck coaming to provide continuity to the coaming's function in stopping skidding aircraft from going over the deck edge.

RECOMMENDATION #1-8 Flight Deck Water Monitor System

The feasibility be investigated of installing on the island structure powerful monitor systems, similar to that developed for the New York Fire Department by De Laval and John W. Stang, capable of projecting large volumes of water up to 400 feet. As a corollary, study the practicability of installing a monitor of this type on escorting destroyer types so that they may assist in fighting carrier fires. Proposed cognizance: NAVMAT

RATIONALE:

1. The New York Fire Department has a fire pump with the following characteristics:

   a. 6000 gpm capacity
   b. 150 ft. per sec. velocity at nozzle diameter of 4"
   c. requires about 650 horsepower
   d. projects a stream 450 ft. at 20° elevation

The reach of this pump allows fire fighters to be a considerable distance from the fire and the force developed (about 125 pounds per square inch) will move ordnance and fuel from the decks. (Jellied Fuels/Improved Fire Pumper briefing)

2. The capacity seems sufficient to cool ordnance of any size, by raining effects or by splash effects off the deck, the aircraft or adjacent aircraft if ordnance is protected from the spray by aircraft wings. The large discharge volume should rapidly wash spillage of fuel from the flight deck. The nozzle can be elevated and trained by one man.

3. Subject to weight and moment considerations such devices might be mounted in the island of a carrier. The reach would be sufficient to deluge almost any section of the flight deck subject, of course, to wind effects. The main advantages of such a device would be: (a) massive and rapid response and (b) the capability of routine checkout without disrupting or damaging flight deck installations. The main disadvantage, aside from the installation problems, would be the ineffectiveness of salt water in extinguishing a fuel fire.

4. In many of the World War II War Damage Reports (FRANKLIN, YORKTOWN, HORNET, PRINCETON War Damage Reports) cruisers and destroyers have been cast in the role of fire boats. This occurred again in the case of FORRESTAL (FORRESTAL Investigation Report). Installation of such a device on a destroyer would enhance its capability in this regard.

RECOMMENDATION #1-9 Interior Communications

Carriers be surveyed to insure that all inhabited areas are within sound range of 1 MC speakers so that the general alarm will serve to alert all hands regardless of location. Proposed cognizance: NAVMAT

RATIONALE:

1. The Report of an Informal Investigation to Inquire into the Circumstances Surrounding a Fire which Occurred on Board USS FORRESTAL states in Vol I page 83:

"333. That the 1 MC ship's announcing system was ineffective in the hangar deck areas; thus denying personnel in these areas important information and directives during the emergency."

The complaint concerning the inadequacy of the 1 MC General Announcing System is universally supported by YANKEE station CVA's visited by the Panel. There are many working and living areas where the 1 MC simply cannot be heard. Some of these deficiencies may be caused by unauthorized alterations but the majority appear to be installation/design deficiencies.

2. A space-by-space survey should be conducted on each ship in order to determine what must be done to provide a system that will be adequate for passing important information or orders during an emergency. It is equally important to insure that the General and Chemical Alarms may be heard in every normally inhabited space throughout the ship and that the inhabitants of these spaces may also communicate the existence of a fire or other emergency in the space to the bridge. In short, command cannot function properly without adequate command and control communications.

RECOMMENDATION #1-10 Fire Hose

The specification for fire hose aboard carriers be changed to require rubber-lined, double-jacketed cotton, neoprene-wrapped hose, to be used on flight deck and hangar deck in order to provide a more wear-resistant hose as well as one less subject to kinking. This hose should be then supplied to CVAs to replace cotton hose as it wears out. Developmental programs should be continued to improve fire hose by decreasing weight, increasing fire resistance, and providing a quick disconnect coupling for use in special areas such as the flight and hangar decks.
Proposed cognizance: NAVMAT

RATIONALE:

1. During the WESTPAC trip, Panel members noticed that the standard cotton fire hose in use on the hangar and flight decks was worn and abraded. In order to avoid restrictive kinks, the hose must be led out to its full length prior to charging. Thus, when holding fire drills on the flight and hangar deck, firefighting teams must drag the hoses across the abrasive non-skid. Ships holding frequent drills are penalized by having to replace fire hose frequently even though hoses are interchanged between flight, hangar and other decks.

2. As part of an evaluation project, the USS AMERICA was furnished with 235 lengths of SYN-FLEX hose 2 1/2" size, manufactured by Goodall Manufacturing Company. This evaluation indicates that the hose has excellent qualities including an estimated service life of six to eight months for hangar and flight deck use (Phonecon between Mr. (b) (6) and LCDR (b) (6), DCA, AMERICA). The hose is easy to use and because of its rubber covering does not kink while running out. Worn areas near the nozzle can be cut off and the coupling reinstalled with no apparent difficulty by ship damage-control personnel. Recognizing the proven superiority of the neoprene hose, NAVSHIPS has specified its use on the flight deck and hangar deck of CVA 67 and CVAN 68 (Specification for Building Aircraft Carrier, Attack, Nuclear, CVAN 68) (Specification for Building Aircraft Carrier, Attack, CVA 67). The hose for CVA 67 will be provided by a separate contractor to the specification which requires rubber-lined, double-jacketed cotton, neoprene-wrapped hose. In view of the above, procurement of this hose for active fleet CVAs appears warranted.

3. In order to reach all sections of the flight deck, it is sometimes necessary to couple an additional length of hose on the 100 foot length now stored. A quick disconnect coupling would measurably reduce reaction time by permitting rapid make-up of hose lengths and attachment of nozzles. Fire hose developmental efforts should continue in order to provide these couplings as well as reduce the weight and improve fire resistance of the hose.

RECOMMENDATION #1-11 Ship Alterations Affecting Safety

All outstanding Ship Alterations and Repair Requests be reviewed for each CVA and those which affect fire fighting and damage control be placed in a "safety of the ship" category for appropriately high priority of accomplishment at Restricted Availabilities and Regular Yard Overhauls. Proposed cognizance: NAVMAT

RATIONALE:

1. Both Fleet Commanders are vitally concerned with completing carrier overhauls and yard availabilities precisely on schedule in order to meet deployment dates without drastically curtailing the already minimal time available for training (Briefings by the Air Type Commanders in both Fleets). As a consequence, time or shipyard capacity has become the limiting factor in CVA overhauls rather than money. Funding limitations, however, may govern in the future. In any event there are always constraints on the amount of work which can be accomplished during a given availability and a priority list must be established.

2. In competition for priorities assigned to repair work are such things as launch and recovery systems, main propulsion machinery and command and control equipment. Of the alterations there are military improvements to support new aircraft and air-launched weapons as well as the command and control and communications suites. In both cases, the repairs and alterations are easily identified.

3. No such easy identification can be made on items affecting fire fighting and damage control. The repair requests on such items as fire main valves, ballasting piping, High Capacity Fog Foam Station controls, magazine sprinkling valves and the like as well as alterations affecting these systems are easy to overlook. This fact combined with Navy-wide apathy toward damage control over the past years has resulted in the low state of material readiness in this important area. The President of the Board of Inspection and Survey speaks to the maintenance problem in a speedletter Ser 01B/mbs CVA 60 Ser 930 of 3 Oct 1967. The letter cited several significant deficiencies on USS SARATOGA noted during a recent inspection. Among those cited were:

a. Inoperative magazine sprinkling systems

b. Deficiencies in hazardous material stowage

c. Flammable material (privacy curtains) in berthing spaces

Also in an inspection of five carriers during the period 4 May - 2 June 1967 the Inspector General, US Atlantic Fleet reported in part:

RECOMMENDATION #1-11 RATIONALE (Cont'd)

"(1) Fire fighting equipment in 3 of the 5 carriers inspected was in satisfactory or better condition.

"(2) An examination of watertight inspection records and watertight boundaries revealed:

(a) Watertight inspections were logged in 4 of 5 carriers.

(b) Watertight boundaries were unsatisfactory in all 5 ships."

(INSGENLANTFLT 14-67)

4. In order to insure that items which affect damage control and fire fighting receive proper priority they must be identifiable. Hence, it is suggested that repairs and alterations be placed in a "safety to the ship" category. These requests may then be reviewed in proper context by the Type Commander and the DCNO (Fleet Operations and Readiness).

RECOMMENDATION #1-12 Liquid Oxygen Jettison

A systems review be accomplished to insure that suitable means exist for the safe, rapid jettisoning of liquid oxygen from aircraft carrier O_2/N_2 plants during emergencies. Proposed cognizance: NAVMAT

RATIONALE:

1. The FORRESTAL O_2/N_2 plant storage tank located on the main deck port side contained approximately 750 gallons of oxygen at the time of the fire. This oxygen constituted a serious threat to the safety of the ship and consequently had to be jettisoned. This plant does not have a rapid-jettison feature and because of this a man had to remain on station with fire enveloping the surrounding area for approximately one hour to drain the tank. (FORRESTAL Investigation Report)

2. A Shipalt has been issued to provide this capability on FORRESTAL Class CVAs. A careful review of all ships appears warranted to insure this important safety feature is not overlooked.

RECOMMENDATION #1-13 Vari-Fog Nozzle

The "Vari-Fog" nozzle be evaluated as a possible beneficial replacement for the foam nozzle and shaper on flight deck and hangar deck High Capacity Fog Foam Stations. Proposed cognizance: NAVMAT

RATIONALE:

During the visit to the Pacific Fleet Training Command (COMTRAPAC) members of the fire-fighting school recommended that the Vari-Fog nozzle, manufactured by the Akron Brass Manufacturing Co., Wooster Ohio, replace the present nozzle and shaper used to dispense foam in the Fleet.(COMTRAPAC brief) This recommendation was based on the simplicity and proven reliability of the Vari-Fog nozzle and on the fact that the present shaper becomes distorted and unsuitable from frequent use. The Board of Investigation of the FORRESTAL fire also recommended that the Akron Brass Mfg. Co. nozzle be procured and distributed because it appeared "to offer increased flexibility over equipment now in use."(FORRESTAL Investigation Report)

RECOMMENDATION #1-14 HCFF Maintenance

Failure rate on components of High Capacity Fog Foam Stations be analyzed and parts support modified accordingly. A review of Planned Maintenance System requirements for HCFF stations should be made to insure a high state of readiness. Design should be improved to greatly reduce the high rate of failure of proportioner seals.
Proposed cognizance: NAVMAT

RATIONALE:

1. High Capacity Fog Foam (HCFF) Stations are not being maintained at a sufficiently high state of material readiness. This conclusion is based on the below listed data which describe the condition of the stations on typical ships reporting to the Fleet Training Group Guantanamo (FLTRAGRU, GTMO) over the period 1965 - 1967 (Carrier Refresher Training briefing by LCDR (b) (6), FLTTRAGRU GTMO).

SHIP	NO. STATIONS	STATIONS OUT OF COMMISSION
CVA W	17	7
CVA X	10	5
CVA Y	10	7
CVA Z	17	4

These conditions were attributed to:

a. Lack of proper maintenance, particularly during overhaul.

b. Inadequate parts support resulting in long delays in procuring spares.

c. High failure rate of proportioner seals due to rapid nozzle shut off.

The unsatisfactory state of these stations was reaffirmed during the Panel briefing by COMTRALANT.

2. Application of the Planned Maintenance System (PMS) should correct the maintenance problem. A check with the Cognizant Chief of Naval Material representative revealed that PMS documentation is available to the carriers. Therefore, it must be concluded that either some ships are not employing the PMS system or the maintenance requirements as prescribed by the PMS are inadequate. Thus, a review of the PMS documentation for HCFF stations and its application by carrier personnel has been suggested.

RECOMMENDATION #1-14 RATIONALE (Cont'd)

3. The Maintenance Data Collection System (MDCS) provides definitive information on part failure rates. This data should be reviewed to determine if changes in ship allowance lists are required. In any event steps should be taken to insure that sufficient spares are stocked within the Navy Supply System.

4. The proportioner-seal failure on nozzle shut off is a design deficiency. During the briefing on CVA 67 and CVAN 68 Damage Control Systems, NAVSHIPS representative indicated that corrective action through a system modification was feasible. This design change should be issued in the form of a Technical Alteration.

RECOMMENDATION #1-15 Relocation of Hangar Foam Monitors

Hangar foam monitors be relocated by raising them from the deck to the bulkheads at a height to prevent obstruction by parked aircraft. Control from the hangar deck to be by reach rods or flexible cable. The controls for the High Capacity Fog Foam Stations supplying the monitor should be placed in the vicinity of the handles operating the reach rods or flexible cable. Proposed cognizance: NAVMAT

RATIONALE:

1. The hangar foam monitors are free to rotate and in some cases impede the movement of equipment on the hangar deck. Because of the location of the monitors, the shapers are frequently not installed, but rather are stowed in brackets on the bulkheads. More often than not, aircraft parked in the hangar partially obstruct the monitors. These conditions were observed during the Panel's WestPac visits.

2. Some of the controls for the High Capacity Fog Foam (HCFF) stations supplying hangar monitors are located behind "Zebra" doors. Therefore, the operator must break condition "Zebra", if set, in order to activate the station. This fact was cited in ORISKANY Investigation Report and confirmed by the Panel on the WestPac visit.

3. If the monitors were relocated to positions on the hangar side bulkheads, manual manipulation could be provided by reach rods or flexible cable. Although it is recognized that the higher location has the disadvantage of not applying the foam close to the deck, it is believed that elimination of the interference and obstruction problems cited above are overriding considerations.

RECOMMENDATION #1-16 Escape Ladders

Metal ladders from catwalks to sponsons, and from the island walkways to flight deck, be installed to provide additional weather-deck escape routes. Proposed cognizance: NAVMAT

RATIONALE:

1. World War II War Damage Reports (Annex C, Bibliography) and the recent accounts of the serious fires aboard the USS ORISKANY and the USS FORRESTAL (ORISKANY and FORRESTAL Investigation Reports) all cite instances of men trapped on weather decks, in the island, flight deck or sponsons. In many cases these men tried to escape by jumping overboard. FORRESTAL had 20 men go overboard, of whom four were never recovered.

2. In the FRANKLIN fire of 30 October 1944 which resulted from a suicide plane attack (War Damage Report No. 56), 18 men of REPAIR 1 were trapped on a hangar deck sponson for about an hour until they could be evacuated to the flight deck by lines and Jacob's ladders. As a result of this experience, the FRANKLIN installed metal-chain Jacob's ladders, with metal rungs and discs at the ends, rolled-up and stopped to catwalks over the sponsons and to the island walkway. These Jacob's ladders were responsible for the escape of the REPAIR 1 personnel to the flight deck and the escape of island personnel during the subsequent fire of 19 March 1965. The USS INTREPID followed FRANKLIN's lead, and installed escape ladders which were responsible for saving many lives in INTREPID when she was damaged in action on 25 November 1944. (War Damage Report No. 56)

3. The need for adequate escape provisions from the island walkway to the flight deck and between the catwalks and sponsons is urgent. Although metal Jacob's ladders, rolled up and stopped to catwalks, would be a good, simple and inexpensive installation for escape from the flight deck, they would not be usable by personnel trapped on sponsons unless unstopped by someone on the flight deck. It is believed that a combination of permanently installed ladders, metal rungs welded to the hull, and metal Jacob's ladders should be considered.

CONFIDENTIAL

RECOMMENDATION #1-17 CVA HERO Survey

A complete Hazards of Electromagnetic Radiation to Ordnance (HERO) survey of each CVA be required after each yard period or major modification to electronic equipment. Proposed cognizance: NAVMAT

RATIONALE:

1. (b) (3) (A) (NML Dahlgren brief, 21 September 1967), (b) (3) (A)

2. (b) (3) (A) Such a survey will indicate how adequate protection can be maintained with minimum interference to radio circuits and the use of radar.

CONFIDENTIAL

RECOMMENDATION #1-18 Command and Control Station Vulnerability

An analysis be made of the vulnerability of the vital command and control spaces (b) (3) [redacted] of modern CVAs to determine if a change in design philosophy is warranted. At the same time a study should be made of state-of-the-art techniques which might be applied to furnish added protection to these spaces. Proposed cognizance: NAVMAT

RATIONALE:

1. (b) (3) (A) [redacted] The following is quoted from the FRANKLIN War Damage Report: "The (b) (3) [redacted] on present CV's is a death trap. (b) [redacted] (b) (3) (A) [redacted]

2. (b) (3) (A) [redacted] This was demonstrated in the ORISKANY fire when critical catapult machinery rooms were damaged.

3. [redacted] (b) [redacted] Catapult and arresting gear equipment must be located adjacent to the flight deck. (b) (3) (A) [redacted]

4. (b) (3) (A) [redacted]

(b)(3)(A)

5. There are state-of-the-art design techniques and hardware which may offer means of better protecting (b)(3)(A) [redacted]. These are, to mention a few:

a. [redacted]

RECOMMENDATION #I-19 Missile Magazine Safety

(b) (3) (A) [redacted] From these studies and an estimate of the probability of such an occurrence, recommendations for corrective action should be made. Proposed cognizance: NAVMAT

RATIONALE:

1. (b) (3) (A) [redacted] (Phonecon Cdr (b) (6) with NAVSEC). (b) (3) (A) [redacted]

3. The Standard ARM is being introduced to the fleet in November of this year. No special safety provisions have been made for the stowage of this weapon, principally because of the urgent operational need for the missile in SEASIA. (b) (3) (A) [redacted] (Discussion, Mr. (b) with NWL Dahlgren).

4. (b) (3) (A) [redacted]

RECOMMENDATION #1-19 RATIONALE (Cont'd)

(b) (3) (A) [redacted]

5. (b) (3) (A) [redacted]

6. With the present trend toward larger motors and the all-up round, the problems of safe missile stowage increase, and the situation merits immediate attention.

RECOMMENDATION #1-20 Portable Exhaust Blower

An effective portable explosion-proof electrical exhaust blower be developed which is capable of exhausting and filtering smoke from shipboard compartments. The blower should be small enough to fit through a 30" X 36" hatch, and as a possible objective should be capable of exhausting a main machinery room in thirty minutes. Proposed cognizance: NAVMAT

RATIONALE:

1. Smoke is a particularly serious, but often overlooked, aspect of fires aboard ship. It decreases visibility hindering fire fighters and hiding escape routes. It causes death by inhalation of poisonous fumes or suffocation from lack of oxygen. After an active fire has been extinguished or brought under control, residual smoke often prevents the remanning of stations and the restoration of casualties. (USS ORISKANY and USS FORRESTAL Investigation Reports)

2. (b) (3) (A) [redacted]

RECOMMENDATION #1-21 Crash Crane Jettison Attachment

A bulldozer-type blade be developed for installation on the flight-deck crash crane to aid in the jettisoning of aircraft from carrier flight decks. Proposed cognizance: NAVMAT

RATIONALE:

1. During the FORRESTAL disaster, the aircraft-handling crews found that it was extremely difficult to jettison burning and fuel-leaking aircraft from the flight deck (FORRESTAL Investigation Report). It is evident that a vehicle capable of rapidly jettisoning the heaviest aircraft is required. (Apparent in motion picture camera coverage of the FORRESTAL fire).

2. The Flight-Deck Crash Crane is capable of exerting the force required to move large aircraft. Installing a large bulldozer-type blade on its forward end will make a vehicle of sufficient power and pushing area available on all carriers. In addition, by using an on-board vehicle no additional space will be required on the flight deck.

RECOMMENDATION #1-22 Damage Control Equipage Allowance

The FORRESTAL and ORISKANY fires be analyzed to determine a more suitable and more adequate allowance for OBA's, canisters, foam, fire extinguishers, hoses and other damage control equipment than now specified for CVA's. Proposed cognizance: NAVMAT

RATIONALE:

1. The fires in both USS FORRESTAL and USS ORISKANY point out the inadequacy of the allowance for fire-fighting equipments, notably OBA's, canisters, foam, fire extinguishers and hoses. These deficiencies are very similar to those reported in War Damage Report No 56 covering three incidents in the USS FRANKLIN during World War II and referring to similar conditions in other carriers. This report states: "The former allowance of 160 OBA's for CV 9 class carriers was found to be totally inadequate for major fires and was increased to 500 (type A) with 8 spare canisters for each unit."

2. The FORRESTAL has an allowance of 550 OBA's and 3300 canisters (six per OBA). The ORISKANY's allowance was 450 OBA's and 2700 canisters (six per OBA). FORRESTAL recommends an allowance of 620 OBA's and 8000 canisters. The ORISKANY's allowance has recently been increased to 550 OBA's and 3300 canisters, but the ORISKANY DCA stated informally that he considers this quantity to be inadequate(conversation with Capt R.E. McCall on 25 August 1967). A possible solution may be to provide for emergency helo lift of emergency kits containing OBA's, canisters, extinguishers, etc., between ships in the force.

RECOMMENDATION #1-23 Funding For Damage Control Equipment

Damage control equipment aboard carriers be funded from an account separate from the ship Operating Target (OPTAR) in order to avoid having safety equipment compete with all other ship upkeep items for the limited funds available. Proposed cognizance: NAVMAT

RATIONALE:

1. Operating funds are allocated to individual ships in the form of an Operating Target (OPTAR) by the type commander. Normal practice is for the ships to further sub-allocate amounts to each department. Out of each OPTAR must be obligated funds for such things as spare parts, consumables such as paper and soap, maintenance items such as wire and sheet metal, habitability items such as paint and deck tile, and replacement of equipage such as worn out fire hose and lost battle lanterns. The amount of the OPTAR is never enough to cover all of a ship's operating needs. Normal practice is to establish a priority list and fund down the list to the point where money runs out. In this system, the completeness of the inventory and the good material condition of damage control equipment must compete with all other consumables, spares, and equipage replacement, for funds. The tendency has been in the recent past, to place damage control gear low on the priority list. This has meant that inventories and material condition of damage control equipment were generally poor. To improve this overall low state of damage control material will require initially special financing.

2. To insure that special funds intended for damage control material improvement are not misdirected, and to prevent future neglect of damage control equipage as the result of low funding priority, it is proposed that a certain portion of ships operating funds be earmarked for damage control equipage and safety items alone, and be accounted for by the type commander separately from the normal OPTAR.

(b) (3) (A)

RECOMMENDATION #1-25 Ballasting Requirements.

A technical review be made to insure the adequacy of CVA liquid-loading instructions, and systems available to remove seawater from JP-5 and NSFO stored in ballast tanks. Deficiencies in individual ships discovered in this review should be the subjects of Ship Alterations. Proposed cognizance: NAVMAT

RATIONALE:

(b) (3) (A)

[redacted]

RECOMMENDATION #1-26 Escape Criteria

Criteria be established to require two means of egress from berthing and working spaces which may be occupied by ten or more men. Where feasible, Shipalts should be issued to meet these criteria in existing ships. Proposed cognizance: NAVMAT

RATIONALE:

1. Design policy as now enunciated requires two separate means of egress from stations manned by ten or more people. No such requirement exists for berthing compartments. (General Specifications for Ships of the U.S. Navy)

2. In view of the potential threat of fire and smoke in carriers, particularly in the gallery deck, it is essential that personnel be afforded maximum opportunity to escape from berthing compartments and maintenance spaces.

3. Officer Bunkrooms or groups of Officer Staterooms are sometimes arranged with one access serving accommodations for more than 20. This is found most frequently below the second deck.

4. In older ships where partial air conditioning has been installed, escape routes are sometimes blocked deliberately to establish air conditioning boundaries.

RECOMMENDATION #1-27 Battle Dressing Station Accessibility

Criteria be established to insure that litter cases can be transported into Battle Dressing Stations and Sick Bay, and that Shipalts be issued to correct deficiencies on existing ships. Proposed cognizance: NAVMAT

RATIONALE:

1. One of the Battle Dressing Stations on FORRESTAL is so located that a stretcher must be upended in order to gain access.(FORRESTAL Investigation Report) Medical response, when a large number of people are involved, requires that the flow, whether on stretchers or ambulatory, be unimpeded by the physical structure of the dressing station. In addition, one of the basic requirements of First Aid is the proper handling of the injured while they await professional medical assistance. During the WEST PAC visit, Panel members confirmed that the situation on the FORRESTAL is not an isolated condition and that more attention must be paid to access to Battle Dressing Stations and Sick Bay.

RECOMMENDATION #1-28 Aircraft Jettison Locations

Individual carrier flight decks be surveyed to determine the best locations for jettisoning aircraft so that damage to sponsons or equipment is minimized. Proposed cognizance: NAVMAT

RATIONALE:

1. During the fire aboard the USS FORRESTAL, major difficulties were encountered in attempts to jettison aircraft (FORRESTAL Investigation Report, FORRESTAL Fire Movie). There were two basic problems:

a. Lack of suitable means to move burning aircraft to jettison locations. This problem has been addressed by Panel recommendation 1-21.

b. Aircraft hanging up on projections extending outboard below the flight deck level.

(1) During the FORRESTAL fire, one aircraft pushed from the flight deck fell on a gun sponson where it remained. A second aircraft became hung up on the boat and airplane (Band A) crane. Neither of these locations was satisfactory for the purpose of jettisoning aircraft.

2. It is not considered feasible, or even possible in the case of some carriers, to eliminate all impediments to aircraft jettisoning. Considerations for arc of fire preclude extension of the flight deck over gun and missile sponsons. Nor is it in general feasible to retrofit existing carriers with flight deck extensions that will overhang other sponsons. Naval Ship Systems Command follows a "clean side" concept in present ship design which results in only gun and missile sponsons extending beyond the flight deck overhang.

3. Existing aircraft elevators provide the primary aircraft jettison locations. Aircraft handling personnel should be aware of other locations where aircraft can be safely jettisoned. It is recommended that surveys be conducted on all carriers to determine what sections of the flight deck periphery are suitable and what are not suitable for jettisoning aircraft and that standard method of marking these locations be established and applied.

RECOMMENDATION #1-29 Survey of CVA Accidents

A technical damage report similar to "A Survey of Carrier Accidents, 1951-1967" which was prepared for the Panel by a member of the staff of the Marine Engineering Laboratory, be published for each significant incident involving damage to a CVA/CVS (a significant incident is defined as one which necessitates an immediate return of the ship to a shipyard or repair facility) for distribution to the fleet so that every carrier is furnished a case history of all major disasters. Work started on the aforementioned paper should be continued in order to develop a complete record of past incidents. Proposed cog: NAVMAT

RATIONALE:

1. In the preliminary phases of the Panel's work it became apparent that a review of previous carrier incidents was essential to the task. In the course of the review it was discovered that although it was a simple matter to obtain WWII War Damage Reports (which accurately described the technical aspects of damage suffered by carriers), considerable difficulty was encountered in obtaining information on subsequent carrier incidents.

2. In order to have available a summary of Post World War II incidents, the Panel requested the assistance of the Marine Engineering Laboratory, Naval Ship Research and Development Center. Dr. (b) (6) was made available for this research and produced "A Survey of Carrier Accidents from 1951-1967." (Annex C, Bibliography). Some of the difficulties encountered by Dr. (b) (6) point up the inadequacies of the present system of documentation:

a. No catalogue or file is maintained of carrier incidents.

b. The only available method of determining the existence of an incident was to search all relevant records, such as the individual ship files of the Navy Historian, the U.S. Navy Operational Archives, and the New York Times Annual Index.

c. When an incident was discovered, the Investigation Report was requested from the Admiralty Section, Judge Advocate General's (JAG) Office. If no report was available, it was assumed none had been made, and the incident was not considered to be of sufficient significance to be included in this summary. However a defect in the method was discovered in the fact that JAG holds only the original copy of the report, which may not be received until sometime subsequent to the incident.

RECOMMENDATION #1-29 Survey of CVA Accidents

RATIONALE: (Cont'd)

3. Reports of Boards of Investigation are not generally suitable for wide dissemination because they contain information which may tend to discredit personnel still on active duty. Further, the charter of investigative bodies requires that they fix responsibility and does not necessarily require a detailed technical investigation of system failures during the incident. The nature of personnel casualties is not described in Reports of Boards of Investigation. These are available only in individual autopsy reports which are not suitable for distribution.

4. A careful technical analysis of carrier incidents with a view toward describing any deficiencies in material, documentation or training would be useful not only to the Material Command but also to the Operating Forces. In addition, an analysis of personnel injuries and deaths would be helpful in guiding the development of individual survival devices. Such an effort would require the cooperation and assistance of the Systems Commands, BUMED, and the Operating Forces and could thereby foster an exchange of information and ideas.

RECOMMENDATION #1-30 Improved Fire Pump Performance

The reliability and performance of carrier fire pumps be improved by the application of recent technological developments in sea water resistant submarine materials. Proposed cognizance: NAVSHIP

RATIONALE:

1. Fire pumps are critical components of fire fighting systems. Pumps have been found to fail because of corrosion, erosion, and the effects of the environment in which they are placed. Efforts are underway at NAVSEC to improve fire pumps by specifying use of 70-30 copper-nickel casings in lieu of presently used monel. Recent laboratory tests by the Naval Ships Research and Development Center of sea water pumps made of titanium have shown no effects of sea water corrosion or erosion for 12,000 hours of operation. Titanium alloys developed for submarine hull construction are available for the construction of fire pumps. The cost of copper-nickel pumps is essentially the same as that of pumps made of titanium alloy. Presently, the life of titanium pumps is decreased by corrosion of the ball bearings which also occurs with copper-nickel pumps. However, this could be corrected by development of improved corrosion-resistant bearing materials.

2. A continuing complaint, particularly on older ships, is lack of fire pump capacity. This is caused not only by degradation in pump performance and down time for maintenance, but by the addition over a period of years of spot air conditioning, electronic cooling and other components requiring cooling water. This situation was observed first-hand during the West-Pac visit. It is proposed that as new pumps are added to increase fire main capacity, or as worn out pumps are replaced, only fire pumps of advanced design be installed. All new construction CVAs should be equipped with improved fire pumps.

RECOMMENDATION #1-31 Fire Fighting Symposium

To focus attention on the importance to the Navy of the subject, Navy-Industry symposia be sponsored on the prevention of fire and explosion and on fire fighting. National Security Industrial Association, American Ordnance Association, Bureau of Mines, etc., are suggested as participants. Proposed cognizance: NAVMAT

RATIONALE:

1. Navy sponsored briefings have proved, in the past, to be effective in presenting the Navy's needs and stimulating industry to meet these needs. Industry has already proven its capability to assist; for example, in providing equipment for the New York City Municipal Fire Department (Briefing on Jellied Fuels/Improved Corrosion Resistant Fire Pumper by Marine Engineering Lab of NSRDC) and in developing foam filling to suppress fuel fires in racing car and aircraft crashes. (Briefing on Fuel Tank Safety Foam by Firestone Tire and Rubber Co.)

RECOMMENDATION #1-32 Control Station Design

That an analysis be conducted of critical control stations aboard carriers such as catapult control, arresting gear control, damage control, aviation weapon movement control, primary fly, hangar bay conflagration control, and fog-foam stations to determine their suitability from the aspects of human engineering and that habitability, display, and communication deficiencies be corrected. Particular emphasis should be placed on functional communications, standard displays, and error proof controls. Proposed cog: NAVMAT

RATIONALE:

1. Members of the Panel visited every important command and control station aboard each of the Yankee Team CVAs, and came away with an impression that the design of most of these stations invites operator error. There are rows of identical stop-start buttons and handles in each of the hangar deck conflagration control stations to control various sections of the sprinkler, fog-foam, and water curtains. In some cases the stop, or emergency, position has been painted red to eliminate some of the confusion (but this color differentiation is not evident under red-lighting conditions). One conflagration control station was observed to have all buttons painted red. There is no logical grouping of switches; the switch furthermost forward may not control the sprinklers that are furthermost forward in the hangar bay. The open-close switch buttons for hangar doors are identical. In most cases controls are not clearly labeled. Many have no label, while others have metal labels which have been painted so many times that they are illegible. Even if they had not been covered with paint, most of the labels have printing which is too small to be read in the poorly lighted space.

2. Communications between conflagration control stations, hangar deck control, fog-foam stations, damage control central, the bridge, Pri Fly are inadequate or unsatisfactory. If the conflag watch sights a fire on the hangar deck he has a choice of dialing hangar deck control on the ship service phone or using the 3 MC hangar deck announcing system. His ship service phone does not have executive override feature so he cannot cut-in on hangar deck control if the line is busy. The same is true if he attempts to dial the bridge. (All ships will soon have an emergency number which may be dialed by any phone and never give a busy signal, but this configuration was installed in only one of the CVAs visited.) The 3 MC and the 1 MC use the same speakers and common amplifiers in the hangar bays, thus making it impossible to use both systems at the same time. The 1 MC has priority of the circuit and cannot be over-ridden by the 3 MC. Acoustics in the hangar bays are poor. During the FORRESTAL fire the 1 MC was used to pass vital information and directions, but personnel on the hangar deck never received these transmissions (FORRESTAL Investigation Report). The ORISKANY Investigation Report makes the following statements concerning communications:

RECOMMENDATION 1-32 RATIONALE (Con't)

"That the ship's service telephone is not a satisfactory system for the reporting of emergencies and a special communication system for reporting emergencies to the bridge is needed.

"That the communications between Hangar Deck Control and the CONFLAG stations is inadequate."

The FORRESTAL Investigation Report makes the following statement concerning communications:

"As the second deck HCFF stations are presently configured, a man on the second deck manning a HCFF station is unable to initiate communications with the crew on either the hangar or the flight deck HCFF stations which are served by his equipment. He has no call button."

These conditions existed on each of the CVAs visited:

Communications between the Air Officer and the Crash and Salvage Officer are inadequate. There is no call box between Pri Fly and Repair 5 (Crash and Salvage). The Air Officer must communicate by SRC-22 (Hickey Mouse) or over the 5 MC flight deck announcing system. Two members of the Panel witnessed an actual fire in an aircraft parked on the aft starboard corner of the flight deck of a Yankee Team CVA. The Crash and Salvage Officer's Hickey Mouse was inoperative and he could not hear the 5 MC at the scene of the fire. There were, in effect, no communications. Fortunately this fire was a minor electrical short.

3. Open control/display loops exist at almost all stations in Pri Fly, Damage Control Central, Central Control, Catapult Control and Conflagration Control. The operator controls are in one location but one or more critical displays, or indicators, are located remotely from the operator. Many display and control markings, their lighting, and their location are confusing and error producing.

4. Pri Fly is poorly designed from a functional or human factors point of view. There are many jury rigged displays and controls. On one ship there was an improvised indicator in front of the Air Officer's station to indicate arresting gear settings. The indicator consists of several small windows each marked with a type aircraft. After the operator set the arresting gear, he flicked a switch which illuminated the proper window to indicate the type aircraft for which the gear was set. This, of course, is a very good idea from the Air Officer's viewpoint, but it adds one more task to the enlisted man on the arresting gear console (which is located behind the Air Officer). He must press the correct switch and then check that the correct light is on. This is a poorly designed loop because the Air Officer is sitting in front of the indicator and the Console Operator cannot check

RECOMMENDATION #1-32 RATIONALE (Con't)

his own work. A better design would be to provide both the Console Operator and the Air Officer an indicator which would light up automatically when the arresting gear has been set.

5. Another example of poor human engineering design is the magazine flooding and sprinkling controls. Every handle is exactly like the one next to it. The printing on labels and instruction placards is so small that it could not be read in a smoke filled compartment with only the light from a battle lantern.

6. Every critical control station should be given an analytical examination to determine their suitability for the human operator and integration with other systems. The man must not be forced to work with any system which dominates the man. The CVA must be considered as a complete weapon system with integrated and adequately engineered sub-systems which contribute to the total mission. Man must be considered to be the predominate part of each sub-system.

RECOMMENDATION #1-33 Conversion of the Aviation Gasoline System to Fire Fighting System

The feasibility be investigated of converting the high capacity aviation gasoline system to a fire extinguishing system (with light water, for example) upon the phase out of aviation gasoline aboard carriers.

Proposed cognizance: BAVSAT

RATIONALE:

1. The advent of all-jet air wings with jet helicopters and turbo-jet support aircraft such as the E-2's and C-2's should, in the immediate future, make it possible to phase out aviation gasoline aboard CVA's. Approximately 90,000 gallons of liquid may be stored, distributed and delivered by the aviation gasoline system. This system could contribute to the fire fighting capability of the ship if converted to a light-water or similar system. One of the principal objections to a light-water fire fighting system aboard CVA's has been the requirement for using fresh water. The high capacity aviation gasoline system appears well suited for conversion. The feasibility of such a conversion should be investigated.

RECOMMENDATION #1-34 Ship Survivability

A broad exploratory development program be established aimed at the improved survivability of major ships. The program should be carefully oriented toward end products; for example, special attention should be given to attack aircraft carrier flight deck operations, fire fighting and damage control improvements, etc. Establishment of a lead laboratory charged with the responsibility for developing damage control concepts with new facilities including simulated flight decks, methods for evaluating fire fighting hardware, potentialities for developing ordnance handling methods, etc., should be considered. Proposed cognizance: NAVAIR

RATIONALE:

1. The Navy needs a re-invigorated exploratory development program, covering all areas aimed at the increased safety of carrier operations. As an example of the need, present-day shipboard fire fighting and damage control are essentially based on means available in World War II. Cross-fertilization amongst the various material aspects of safety in operations is especially needed. A helpful step in this direction would be the development of a computer simulation model capable of tracing possible chain reactions from various hypothesized incidents (both accidents and enemy-initiated events) and testing, computationally, the efficiency of various proposals for enhanced safety.

RECOMMENDATION #1-35 CVA Computer Model

The application of computer techniques to CVA problems be investigated. Through such techniques one might optimize relative safety versus operational aspects of the CVA system as a defended, mobile, forward floating air base through the use of a computer simulation model incorporating rates of launching, recovery, rearming, and relaunching with changes in method, manning, and equipment for breaking out and striking down ammunition and the like. Proposed cognizance: OPNAV

RATIONALE:

1. Any current or future recommendation for enhancing the safety of aircraft carrier operations will probably affect to some degree the carriers' overall operational capability. A computational model would be helpful in assessing the effect of contemplated changes. Such a model might also become a useful tool in developing procedures for estimating the relative safety of modes of operations. The model could be used to evaluate the effect on safety of varying operational tempo (e.g. launch and recovery intervals, aircraft loading). This analysis could expose particularly hazardous combinations of circumstances which should be avoided. For example, recovery intervals could well preclude safing of missiles, thus creating a hazardous situation depending on the weapons involved.

RECOMMENDATION #1-36 Habitability Improvements

Habitability items such as mattresses, curtains, deck and bulkhead coverings, furniture, paint and the like, be reviewed to insure that materials of minimum flammability are selected to serve their intended purpose. Air conditioning is considered a prime and very necessary habitability item, but it should be installed with due consideration for facility of establishing fumetight, airtight, or watertight boundaries within the ship. Proposed cognizance: NAVMAT

RATIONALE:

1. The great improvements in ship habitability have required the substitution or addition of materials which, if involved in a fire, release more heat than those formerly employed. For example:

a. Aluminum modular berths have replaced steel pipe berths.

b. Foam rubber mattresses have replaced the stuffed cotton mattress.

c. Deck tile has replaced paint or base metal as a walking surface.

d. Privacy curtains have been added.

e. Bulkhead and overhead sheathing have been added.

f. Overstuffed furniture and rugs are being more widely used.

In addition, some of the new materials tend to release toxic vapors when exposed to fire. A case in point is the chlorinated alkyd paint used in ship interiors, which when it burns or decomposes under heat, may release hydrochloric acid (Toxicity and Fire Hazards Associated with Shipboard Materials, NRL Memorandum Report 1816). Therefore, new or continuing developmental programs to modify, replace, or augment these materials should include specific efforts toward reducing combustibility and toxicity. Specifications for procurement and installation must be rigid enough to insure these safety features are realized in the product.

2. Air conditioning continues to be an important habitability item. Older ships were not centrally air conditioned. Hence, programs to date have provided spot air conditioning in command and control spaces and some living areas. As a result, ventilation systems have been modified or augmented. It is important that watertight, airtight, and fumetight integrity not be violated as a result of these modifications.

RECOMMENDATION #2-1 Current MK V Mask Capabilities

Information be promulgated throughout the fleet setting forth the capabilities and limitations of the MK-V Protective Mask ("gas mask") as an escape breathing device in its present configuration. Proposed cognizance: NAVSAT

RATIONALE:

1. In a report to the Chief of Naval Research of 18 September 1967, Dr. (b) (6) (NRL) indicated that the protective mask as now configured is a useful escape breathing device. "The mask removes all particulate matter and most (except CO and CO_2) of the gaseous fire products." He said: "The mask would also reduce the temperature of hot inhaled air and would constitute a heat shield for the face." This recommendation was supported by a discussion of fire aboard the FRANKLIN in 1945 wherein nearly 500 men were trapped below the hangar deck for about 40 hours by multiple fires topside. Although all the men were dead at the end of 40 hours, many were alive for the first 24 hours. Those were the small party of men who wore masks all the time. In fact, evidence shows they wore two; when the first became clogged with smoke, they donned fresh ones. There were indications that those who died early did not wear their masks even though they were available.

2. While a protective mask has certain features that make it useful as an emergency escape breathing device, the present MK-V mask also has certain limitations. These are known and are far outweighed by the protective advantages offered by the mask in a fire as discussed above.

3. The allowance for the MK-V Protective Mask provides for 105% of the complement. On the WestPac trip, the Panel observed that one of the CVAs had issued the masks. In the remaining ships, the masks were stored in storerooms.

4. In War Damage Report 56 on USS FRANKLIN (CV-13), the statement was made, "On the basis of the service experience it is apparent that Navy Service Gas Masks are reasonably effective against smoke. Personnel must be thoroughly acquainted with their limitations, however."

RECOMMENDATION #2-2 OBA Training Canisters

Oxygen Breathing Apparatus training canisters be procured in quantities to satisfy fleet training requirements. Proposed cognizance: NAVMAT

RATIONALE:

1. The effectiveness of the Oxygen Breathing Apparatus (OBA) is to a large degree dependent on the knowledge of the user. During panel briefings by both COMTRALANT and COMTRAPAC, the need for training with the OBA was emphasized. The complaints in the ORISKANY Investigation Report concerning the short life of OBA canisters are in part traceable to improper training. Even in the FRANKLIN War Damage Report (War Damage Report No. 56) the need for training in Rescue Breathing Apparatus was stressed.

2. It is felt that every man aboard ship should have training in the OBA. This is particularly true of Air Wing personnel on carriers. In a major conflagration such as occurred on ORISKANY or FORRESTAL, Air Wing personnel can assist in fire fighting and rescue provided they are properly trained.

3. By a BUSHIPS NOTICE 9930 dated 3 February 1966, ships allowances were modified to provide quick start canisters only. Effective training in OBA's using this canister should include the actual manipulation of the quick start candle assembly. Recognizing this need, NAVSHIPS has developed a special training canister. This unit simulates the quick start canister in all respects and consists of a canister, 40 metal tear-off caps, 40 candle assemblies, 5 lanyard and cotter-pin units, and one fire-mechanism assembly. The complete unit will cost $100.00 or $2.50 per trainee. (Rescue Breathing Apparatus briefing by NAVSHIPS).

4. NAVSHIPS ltr Ser 6134-32 of 16 Jan 1967 to the Chief of Naval Operations recommended approval of funds to purchase three units per repair station. As was stated above, all personnel should have working knowledge of the OBA. Thus, allowances of training canisters should be sufficient to permit each man to operate the device at least once a year. Repair party personnel may require additional training in order to increase their proficiency.

RECOMMENDATION #2-3 Emergency Breathing Apparatus

In order to enhance personnel survival during emergencies:

a. The MK-V Protective Mask be adapted as an escape-breathing device as well as a "gas mask" through the addition of a small portable air supply. Air supply fittings should be compatible with those found on the Full View Emergency Air Line Mask now employed on submarines to permit connection to ship's service air supply through appropriate filters.

b. The MK-V Protective Mask (or its successor) carrying container be redesigned to function as a shipboard disaster survival kit with compartments for mask, emergency air supply, flashlight, gloves, knife, etc.

c. Full View Emergency Air Line Masks be installed in critical watch stations such as pump rooms, shaft alleys, steering gear rooms, and emergency generator rooms, where continued manning during a disaster is essential or where access is limited and may be blocked by fire or water.

d. Banks of charged air flasks be located in compartments where suitable ships service air is not available. Proposed cognizance: NAVSHIP

RATIONALE:

1. There is an pressing need for devices which will enhance the chances of personnel survival during a fire. The MK-V Protective Mask is in the fleet in quantity today. Carriers have these masks on board in the amount of 105 percent of the on board allowance of personnel. This is now a useful device for survival in a smoke filled atmosphere (see Rationale, Recommendation #2-1). However, it is felt that this basic mask with minimum modification could become an effective escape breathing device. The Full View Emergency Air Line Mask also has potential applicability to the personnel survival problem. Although the SCUBA is a proven escape breathing device, it is felt that its fleet introduction should be a fall back position if modifications to the Protective Mask prove to be infeasible.

2. The protective mask could be modified by the attachment of a lightweight compressed air cylinder which could be charged from the ship's air system to provide the breathing air necessary to survival in an oxygen deprived or contaminated atmosphere. Calculations show that a volume of 0.3 to 3.0 cu. ft. of air at 150 psig (depending on physical activity of the user) will be sufficient to sustain a man for 15 minutes. Air in existing ships systems is suitable for breathing for this period of time. The addition of an activated carbon disc for use during filling, or the use of the filter supplied with the mask, will ensure that clean air will be available. (Discussion Mr. (b) (6) and Marine Engineering Laboratory Personnel) The adapter fittings on the Mark V Protective Mask should be made compatible with those now used on the Air Line Mask. Air Line Mask filter units off the compressed air main could then be provided in each living compartment

to permit charging of emergency air cylinders, or if necessary, air could be supplied from the large compressed-air flasks. In a letter Ser 6134 of 16 Jun 1967, NAVSHIPS estimated the cost of modifying the MK-V Mask at $5.00 per unit.

3. The Full View Emergency Air Line Mask is currently supplied to submarines. The user obtains air from the ship's compressed air system through a filtering unit. The hose furnished with the mask is 6' long and, therefore, the movement of the wearer is limited. As a result, this mask is not suitable for wide-spread use on surface ships. It would be useful in watch stations such as shaft alleys, pump rooms, steering rooms, plotting rooms, where access might be blocked by flooding or fire-fighting water. In areas where ships compressed air lines cannot be conveniently run, compressed air bottles may be provided. (Rescue Breathing Apparatus Briefing by NAVSHIPS) In the letter referenced in paragraph 2 above, NAVSHIPS estimated the cost of Air Line Mask installation to be $250.00 per watch station.

4. The NAVSHIPS letter mentioned the purchase of the self-contained oxygen-breathing escape apparatus (SCOBEA). The SCOBEA has been developed and evaluated for fleet use. It has two disadvantages:

a. It does not cover the eyes (goggles of course may be supplied and worn).

b. It adds another device to the enlisted man's personal equipage since it does not replace the Protective Mask.

5. As was described above, it is necessary for every man to have a protective mask. This mask fits into a carrier or holder which could be simply modified to include a flashlight, insulated gloves and a knife. Since the mask is personal property, it should always be available to the wearer. With the addition of the few extra items described, the mask would become an effective emergency escape kit. With an extra pocket added, in addition to that required above, there would be room for other items such as cutting pliers, etc. that a man might like to keep with him.

RECOMMENDATION #2-4 Identification of Damage Control Leaders

A distinctive device(s) in the form of a badge, helmet, jersey or brassard be provided for damage control party leaders and that such identification be standardized throughout the fleet. Proposed cognisance: OPNAV

1. Key damage control personnel must be identified so that in the event of a disaster their leadership is acknowledged by personnel not directly involved in fire fighting or rescue efforts. There is always a tendency during an emergency for untrained personnel, not otherwise occupied, to try to lend a hand. Frequently these well intentioned efforts tend to escalate the casualty rather than correct it. (Damage Control Ready or Not, briefing by Cdr (b) (6)) The FORRESTAL Investigating Board recognized this problem and recommended "That key personnel, particularly key repair party personnel, be issued and wear a more distinctive badge, hat, or brassard which is readily discernible to promote better on-the-scene control and identification" (FORRESTAL Investigation Report).

2. The adoption of special identification devices for damage control personnel may have ancillary benefits. Comments on the poor morale of the damage control personnel were heard frequently by the Panel members visiting WestPac carriers. The importance of trained scene leaders and the need for a professional approach to damage control was emphasized during COMTRALANT and COMTRAPAC briefings as well as the briefing, "Damage Control Ready or Not" by an ex-CVA Damage Control Assistant. Recognition is a proven method of boosting morale. Therefore the special identification devices may well serve as a badge of honor for the shipboard damage control leader.

3. Damage control personnel are already required to wear helmets which could be emblazoned with a suitable decal. In addition, a jersey (distinctive from flight deck personnel), brassard or distinctive vest such as are worn by traffic patrolman could be provided at minimal cost.

RECOMMENDATION #2-5 SRC-22 (MICKEY MOUSE) For Ordnance Personnel

An allowance be established to provide Aviation Ordnance Officers and Explosive Ordnance Disposal Officers with SRC-22 (MICKEY MOUSE) headsets to permit them to communicate with the Air Officer during emergencies which may require rapid dearming of aircraft. Proposed cog: OPNAV

RATIONALE:

1. During combat operations when explosive ordnance is present on the flight deck, potentially hazardous situations develope which require the immediate attention of the Aviation Ordnance Officer or the Explosive Ordnance Disposal Officer. (Personal Observations of Panel members during WEST PAC visit). At such times direct communications between these Officers and Primary Fly Control are essential.

2. Subject to the reliability of the basic hardware, the SRC-22 (MICKEY MOUSE) is the only system which can adequately meet this requirement.

RECOMMENDATION #2-6 Flight Deck Personnel Equipment

The responsibility for the development and procurement of flight deck personnel equipment be consolidated at the Naval Air Systems Command and a program initiated to develop the protective and survival equipment required by the unique and demanding environment presented by carrier deck operations. Proposed cognizance: NAVMAT

RATIONALE:

1. Personnel who carry out their duties on the flight decks of aircraft carriers necessarily work in a physically exhausting and hazardous environment. This environment normally includes winds of 40 knots, decks that are rolling and slippery and heavy aircraft which are often in motion during both day and night operations.

2. The protective and survival equipment provided flight deck personnel working under these conditions is considered to be inadequate, both by personnel of carriers visited and Panel members who observed these operations. Significant inadequacies include the following:

a. Life vests now on ships are too cumbersome to wear while working in, under and around aircraft. An acceptable life vest has been developed, but is not available to the fleet in quantity.

b. Present helmets offer no impact protection.

c. Present goggles restrict peripheral vision.

d. Present shoes are soft-toed and easily slide on wet decks.

e. Jerseys are not fire-retardant treated. The process of rendering clothing fire-retardant is well known and has been documented, e.g., in Naval Air Development Center, Johnsville report NADC-ML-L-6415 of 18 November 1964.

3. Currently, the responsibility for the subject equipment is divided between various commands such as:

a. Naval Ships Systems Command (NAVSEC 6120) who is responsible for developing life vests,

b. Naval Air Systems Command (NAVAIR 531) who is responsible for head protection, including eye and ear protection.

c. Naval Supply Systems Command (NAVSUP 063) who is responsible for work shoes and colored jerseys. It is felt that the fragmentation of responsibilities for personnel equipment contributes to its inadequacy. A single manager who is aware of the need for specialized apparel for flight and hangar deck personnel safety and survival should be designated

RECOMMENDATION #2-7 OBA Improvement

A program be established to improve the oxygen breathing apparatus (OBA) by employing latest materials and techniques to reduce the size, simplify operation, and extend canister life. Proposed cognizance: NAVSAT

RATIONALE:

1. The oxygen breathing apparatus (OBA), although an excellent life-saving apparatus when operating properly, has been reported to have serious limitations. During the FORRESTAL fire, many of the OBA canisters did not last the specified 30 minutes. Difficulties were experienced with timers not working properly and with broken straps and holes in the mask itself.

2. After the ORISKANY fire, the investigative board reported that many cases of difficulty in the use of the OBA were observed to be caused by personnel getting: "much less than the normal period (of operation) from a canister". Broken parts were reported to be caused by deterioration and rough handling.

3. Although it is realized that defects caused by deterioration are hard to prevent, much can be done to simplify OBA construction. For instance, if the standby latch were always in the "active" position, it would only be necessary to insert a canister for the OBA to operate. As now constructed, the latch must be moved to "active" after the canister is inserted.

4. Personnel from the Naval Research Laboratory in their report: Toxicity and Fire Hazard Associated with Shipboard Materials, suggest that research on the properties of mixtures of potassium superoxide with one of several oxides could provide sufficient improvement to make the canister more efficient and useful. It was also indicated that past research on calcium superoxide was potentially promising as a new oxygen source.

5. The above suggests that exploitation of new materials, design, and techniques could produce a smaller, simpler, more rugged and longer lasting OBA.

RECOMMENDATION #2-8 Improved Proximity Suit

An improved proximity rescue suit, including boots, be procured for Hot-Suit Men of carrier and field Crash and Salvage Crews, these improvements to include resistance to tear and abrasion, reflection of heat, and increased flexibility. Proposed cognizance: NAVMAT

RATIONALE:

1. The aluminized fabric now used in fire-fighting clothing tears easily, loses its heat-reflective qualities when soiled, and restricts mobility. Furthermore, these proximity suits are not large enough for the average hot-suit man who, because of the strength requirements of his job, is often larger than the average sailor. Also, present helmets do not have proper ventilation. These deficiencies were observed by Panel members during the WestPac visit and by Panel members when formerly assigned to carriers for duty.

2. There have been vast improvements in aluminized fabrics, both in resistance to abrasion and in the effectiveness of the aluminum coating (from "Development of Improved Aluminized Fabrics for Fire Fighter Clothing", Navy Supply Research and Development Facility, July 1955). In addition, there are advances in modern fabrics incorporating the wet-state concept. ("A comparison of Reflective and Non-Reflective Materials for use in Proximity Fire Fighter Clothing", Navy Supply Research and Development Facility, Bayonne, May 1966.) These improved fabrics and size considerations should be utilized in the fabrication of a new fire-fighting garment.

RECOMMENDATION #3-1 Improved Survivability of Aircraft

A program be initiated to test and, as feasible, retrofit U.S. Navy combat aircraft with components of the RAND Corporation proposals for improvement of aircraft survivability; these proposals include the use of reticulated foam fillers for fuel tanks and ARM-24 material for puncture resistant fuel cells. Proposed cognizance: NAVMAT

RATIONALE:

1. RAND Corporation has studied aircraft survivability and has collected a number of available new developments which, if incorporated in combat aircraft, would significantly reduce their vulnerability to fuel fires resulting from battle damage (Interview: RAdm J. L. Holloway, III and Cdr. (b) (6) (b) (6) 29 Sept 1967 with Mr. Roger P. Johnson, RAND Corporation). The entire Panel was briefed in detail on two of the developments cited by RAND:

a. A reticulated polyurethane foam to be used as a filler in fuel tanks. It would reduce the chance of massive fuel-cell rupture in the case of severe impacts. This foam was described by Firestone representatives at the briefing, "Fuel Tank Fillers" on 29 September 1967.

b. A product known as ARM-24 which is an improved fuel-cell material. It is highly shock, puncture, and tear resistant. A coagulant is contained in the skin of the material which runs out and solidifies when the material is punctured or torn.

2. CINCPACFLT strongly supports exploitation of these new technical developments for combat aircraft survivability (ADMIRO CINCPACFLT 140307Z September 67 and 200512Z September 67). OPNAV (Op-05 and Op-50) have been briefed by Mr. Johnson and are fully cognizant of the program he proposes.

3. The FORRESTAL fire and other accident reports reveal the extensive loss of life and property that can result from the rupture of inadvertently released aircraft drop-tanks. The use of reticulated foam filler and improved material in fuel-tank fabrication could markedly reduce the fuel flow resulting from the rupture and the proportional intensity of the fire.

RECOMMENDATION #3-2 Bomb Hook Pin Requirements

Instructions be issued to eliminate the present bomb hook pin requirements for the MER/TER racks on the flight deck and substitute procedural steps in bomb loading to insure mechanical locking of the bomb hooks when bombs are loaded. Proposed cognizance: NAVAIR

RATIONALE:

1. The Multiple Ejector Rack (MER) and Triple Ejector Rack (TER) require two safing pins per bomb station for mechanical safing, and one safing pin on the tail section for electrical safing. This means that a fully loaded A7 aircraft (6 MERS) could have 87 pins (78 for the MERS, 3 for main landing gear, and 6 for parent wing racks). This constitutes a serious foreign object damage hazard on the flight deck.

2. The suggested procedure to reduce the number of pins on the flight deck is to have supervisory ordnance personnel check the mechanical closure of the bomb-rack hooks by inserting and removing the pin in each of the MER/TER mechanical safing holes. The electrical safing pin should be left in position until the aircraft is about to be launched.

RECOMMENDATION #3-3 Rack Safing Devices

A Tentative Specific Operational Requirement be established for aircraft bomb racks which specifies a single safing device for both mechanical and electrical safing. The device should be integral with the rack. Proposed cognizance: OPNAV

RATIONALE:

1. Present aircraft bomb racks require numerous red-flagged safety pins in order to insure that they are both mechanically and electrically safed. The A6 aircraft, with five (5) fully loaded Multiple Ejector Racks (MER), requires a total of sixty-five (65) pins in order to comply with rack design requirements. This condition creates an undesirable hazard on the flight deck. The flagged pins, upon accidentally becoming dislodged, provide a prime source of jet engine foreign object damage.

2. A possible solution is to have all racks manually and electrically safed from a position on the ground through the use of a single device which is integral to the rack. This device could utilize a warning pin visible from the cockpit, much like the wingfold pin, which would warn the pilot of a safed rack.

RECOMMENDATION 63-4 Weapons Handling Equipment

Weapon handling equipment, both manual and hydraulic assisted, should be developed for use on carrier flight and hangar decks. Principles of safety and human engineering should be of prime consideration. Proposed cognizance: NAVMAT

RATIONALE:

1. In the high-tempo strike operations of SEASIA, the method of loading bombs aboard carrier aircraft is almost entirely accomplished by manual means using so-called hernia bars. To a limited degree, the AERO 33 C/D bomb truck is used. The hernia bar is a metal pipe or cradle manufactured on board individual ships. Its local manufacture omits the safeguards of proper design and assembly and the bar is frequently too short to allow a sufficient number of men to assist in weapons loading. The hernia bar constitutes a definite hazard to loading personnel.

2. The AERO 33 C/D bomb truck is manually maneuvered, has a handpump lift (in the C version) or the choice of a handpump or battery-powered hydraulic lift (in the D version) and will hoist 4000 pounds. It weighs 1465 pounds and is extremely unwieldy. ("Catalog of Handling Equipment for Weapons and Explosives," NAVORD OP 2173 (Volume 3), Second Revision, dated 1 March 1967). Because of its clumsiness, loading crews seldom use it.

3. The AERO 46A mechanical loader proposed for carrier use is a diesel-powered hydraulic weapons loader capable of lifting 4500 pounds. ("Ordnance Handling Equipment" Briefing by AIR 534 on 27 September 1967). It is too large to be an efficient vehicle in the confined area of a carrier flight deck under the present conditions. It is designed primarily to move and lift loaded MER/TERs. Until the Improved Rearming Rate Project is installed in carriers, the preloading of MER/TERs is not practical, and consequently the AERO 46A loader is not now a useful piece of equipment.

4. It is evident that a requirement exists today for the following weapons handling equipment:

a. Manual handling tools, hernia bars, that are human and safety engineered and fabricated for lifting of weapons weighing from 250 to 1000 pounds.

b. A simple, compact and manual-hydraulic lift-assisted weapons loader that has a lift capacity for weapons weighing from 250 to 1500 pounds.

5. Plans should be made now to provide the AERO 46A mechanical loaders for squadrons ashore in training for the utilization of pre-loaded MER/TER racks when the Improved Rearming Rate Project is installed in carriers.

RECOMMENDATION #3-5 AERO 12A Bomb Skid

The present AERO 12A bomb skid strap buckle be redesigned to provide reliable security. Proposed cognizance: NAVAIR

RATIONALE:

1. The AERO 12A bomb skid ordnance restraining strap buckles are not reliable when under tension (refer to COMNAVAIRPAC NOTE 008010). It was observed by Panel members, on the August 1967 West Pac trip, that the buckles allow the strap to slip, which in turn permits the ordnance to move on the skid and strike the deck, causing possible damage to the bomb fuze well or tail assembly.

RECOMMENDATION #4-1 Increased Munitions Cook-off Time

Ship borne ordnance cook-off times in a conflagration be a recognized design consideration. Means to increase cook-off times should be developed and applied to current and future weapons, with back fitting as practicable. Proposed cognizance: NAVMAT

RATIONALE:

1. The July 1967 FORRESTAL fire was intensified by the explosion of one or more 1000-pound bombs 94 seconds after the first flames were observed. (b) (3) (A) [redacted] From the USS FORRESTAL July 1967 incident and similar intense fires experienced during World War II, it is evident that short cook-off times make it difficult, if not impossible, to cope with such fires even with well-trained fire fighting crews.

2. Therefore, an effort to increase bomb cook-off time should be made. (b) (3) (A), (b) (6) [redacted]

RECOMMENDATION #4-2 In-Line Explosive Train Fuzes

[redacted] (b)(3)(A) Proposed cog.: NAVAIR

RATIONALE:

[redacted] (b)(3)(A)

b. World War II Vintage Mechanical Bomb Tail Fuzes - These fuzes have in-line explosive trains which, when armed, are very sensitive to decelerations. They are presently restricted from carriage on jet aircraft and from recovery on board CVAs (Classified Supplement to NAVAIR Ordnance Pamphlet 2216 Part 2 Second Revision) because an arrested landing can provide enough deceleration to fire the fuze if accidental arming has occurred. [redacted] (b)(3)(A)

c. [redacted] (b)(3)

RECOMMENDATION #4-2 In-Line Explosive Train Fuzes (Cont'd)

(b) (3) (A)

[redacted]

2. Commander, Naval Air Systems Command has recently recommended the reclassification of our Navy Stockpile of Bomb Fuzes (NASC letter AIR-53233-D: LAW Ser 07246 of 2 Oct 1967 to CNO). This Panel's recommendations, in general, are consistent with NAVAIRSYSCOM's recommendation. However, the Panel's recommendations are directed specifically to CVA's and therefore are extended to eliminate some fuzes cited as usable by this document.

RECOMMENDATION #4-3 MK 36 Destructor

The safing features of the MK 36 Destructor be improved. Proposed cognizance: NAVSEA

RATIONALE:

(b) (3) (A)

[redacted]

2. In this instance, the entire system worked as designed including the out-of-line safeguard. However, design improvements should be made to preclude recurrence of similar incidents in order to reduce the probability of a major explosion.

RECOMMENDATION #4-4 Fuze Quality Control

Methods of fuze production quality control be reviewed to insure delivery of safe fuzes regardless of procuring service. Proposed cognizance: NAVMAT

RATIONALE:

1. Some operational fuzes can be assembled in an unsafe condition. (Briefing, "Panel to Review Safety in Carrier Operations" published by the Naval Ordnance Laboratory, White Oak on 25 September 1967, file 5420 Serial 001043.). [redacted] (b) (3) (A)

RECOMMENDATION #4-5 Rocket Environmental Safety Device

A requirement be established for an environmental safing device for rocket motors and design studies be initiated for a device capable of retrofit into current motors now in stockpile. Proposed cognizance: NAVMAT

RATIONALE:

1. The 29 July 1967 fire on the USS FORRESTAL was initiated by a single Zuni rocket inadvertently fired from a LAU-10 launcher. Examination of ordnance incident records held at the Naval Weapons Laboratory, Dahlgren reveals that several similar accidental rocket ignitions have occurred. Had this type of ordnance been protected by an environmental rocket-igniter safety device, the FORRESTAL fire would have been avoided. Such a safety device should be designed to prevent rocket motor ignition except when the missile-carrying aircraft is in flight and at operational speeds.

RECOMMENDATION #4-6 HERO-Safe Munitions

Present efforts to design and deliver HERO-safe new production munitions continue at high priority and that stocks of non-HERO-safe ammunition be restricted from carriers and limited to use only by shore-based aircraft. Proposed cognizance: NAVMAT

RATIONALE:

1. Observations of HERO (Hazards Electromagnetic Radiations to Ordnance) restrictions reviewed during fleet operations in SEASIA and presentations made to this Panel by the Naval Weapons Laboratory, Dahlgren and the Naval Weapons Center, China Lake have indicated the need for continued effort to further the HERO program. HERO-set conditions aboard CVAs impose severe communications restrictions which adversely affect operations.

2. Ordnance should be designed and manufactured so that CVAs can operate safely without the need for HERO restrictions; those weapons that do not meet minimal criteria should be restricted from use aboard carriers. Stocks of these munitions can be effectively consumed by shore-based units.

RECOMMENDATION #4-7 Rocket Motor Ignition System

A study be conducted on existing rocket motors to determine if their igniters and propellants can be made less sensitive without degrading their capability. Apply this knowledge to the development of new rocket motors. Proposed cognizance: NAVAIR

RATIONALE:

1. Panel interviews and briefings at Naval Weapons Center, China Lake and Naval Weapons Laboratory, Dahlgren (NWL) indicate that inadvertent rocket firings are not uncommon. A recent survey conducted by NWL shows that 13 accidental rocket motor firings have been reported since 1963.

2. The serious consequences possible as the result of such inadvertent firings are illustrated by the fire aboard the USS FORRESTAL on 29 July 1967, which was caused by the firing of a five-inch Zuni rocket from an F-4 (for reasons not clearly established) into an A-4 drop tank (FORRESTAL Investigation Report).

3. Two more subsequent accidental rocket firings, which occurred in September 1967, also resulted in property damage and personnel injury. (Marine Corps Air Station, Yuma report by Attack Squadron 195 message 162328Z September 1967 and Naval Air Station, Oceana report by Fighter Squadron 84 message 281723Z September 1967)

4. The primary cause for inadvertent rocket propellant ignition, other than direct personnel error, is the introduction of small amounts of stray voltage into the firing squib circuit. These firing currents can result from a stray voltage induced by external radiation and electromagnetic discharge. The problem is that, under present design, only a small amount of current such as could be provided from these obscure sources will actuate the firing squib. A squib requiring an energy pulse of greater magnitude would substantially reduce the incidence of induced and stray-voltage caused firings.

5. [redacted] (b) (3) (A) [redacted]

RECOMMENDATION #4-S Pre-Belted 20 MM Ammunition

20 mm ammunition be pre-belted at shore activities in order to reduce ammunition assembly time and handling aboard CVA's. This pre-belted ammunition should be outloaded with HERO shields in place. Proposed cognizance: NAVMAT

RATIONALE:

1. Belting and shielding of 20 mm ammunition aboard ship is time consuming and exacting. Responsible ship-based ordnance personnel are required in addition to this effort to accomplish numerous other demanding ordnance functions during high-tempo combat operations. The added effort can only contribute to the possibility of ordnance handling and assembly mistakes of potentially serious consequence.

2. Precise belting procedures must be followed or guns will jam resulting in an unacceptable operational deficiency and possibly causing material damage. In either case, the effectiveness of the firing aircraft will be compromised. If ammunition HERO shielding is not installed, there is a possibility of firing the primer by stray electromagnetic radiation or from static electricity discharged from the ordnance handling men to the primer case.

3. Belting and shielding by ashore activities will improve quality assurance, relieve space congestion aboard ship, and free hard-pressed shipboard ordnance crews for other duties.

RECOMMENDATION #5-1 Air Wing DC/Fire Fighting Training

Air wing personnel receive fundamental training in basic damage control and ship disaster survival prior to embarkation for deployment.

Proposed cognizance: OPNAV

RATIONALE:

1. The air wing now constitutes about 40% of the embarked personnel aboard a deployed attack carrier (Briefing by COMNAVAIRPAC Force Personnel Officer, 6 September 1967).

2. During the major fires aboard USS ORISKANY and USS FORRESTAL, an even larger percentage of crew members directly involved in the fire were air wing sailors because of the very nature of their duties. Many of these air wing personnel, despite their courageous acts and strong desire to help, were ineffective and in some cases a hindrance to the fire fighting effort. (ORISKANY and FORRESTAL Investigation Reports). These men had received no formal training in fire fighting or the principles of damage control.

3. During a carrier's refresher training period, which is primarily devoted to ships damage control training, the air wing is not aboard, and no substitute damage control training is provided.

4. It is recommended that air wing officers and men receive fundamental damage control education and training before embarking for a deployment. This program should include:

a. Actual firefighting training

b. Demonstration of the latest fire fighting techniques

c. Fundamentals of ships damage control

d. Damage control organization and procedures of carrier to which assigned.

e. Fundamentals of personal survival in ship disasters

f. Instruction in the use of basic damage control equipment such as MK V Protective mask, OBA, fog, foam, CO_2, Purple K Powder, etc.

RECOMMENDATION #5-2 Fleet Damage Control Training Facilities

Fire-fighting and damage control training facilities be expanded to meet Fleet needs. New methods such as mobile teams and mobile trainers should be investigated to meet CVA needs for this training at locations in proximity to the ship. Proposed cognizance: BUPERS, LANTFLT/PACFLT

RATIONALE:

1. Carrier personnel are not receiving the necessary training in fire-fighting and damage control. The Type Commander requirements cannot be met for the following reasons.

a. Fleet fire-fighting and damage control schools do not have sufficient capacity.

b. Rapid turn-arounds result in insufficient time for full utilization of the training facilities.

c. Personnel turnover results in a need for additional training when facilities are not available.

2. The following pertinent data were collected during briefings by COMNAVAIRPAC, COMTRAPAC, COMNAVAIRLANT, COMTRALANT.

a. COMNAVAIRPAC requires that the executive officer, and all repair party personnel attend a five-day fire-fighting course and all other personnel, including the Air Wing attend the two-day course. In FY '67, quotas were available to meet about 60% of the requirement. Note the present requirement does not include the Air Wing. During FY '67 only 226 Air Wing personnel were trained.

b. The entire capacity of the West Coast Fire-fighting schools would be required to meet the NAVAIRPAC requirement alone. At present, the schools provide training to meet about 14% of the NAVAIRPAC requirements and 18% of the requirements for the rest of the Pacific Fleet.

c. Although the fire-fighting school quotas are fully allocated, the classes are not always full because of so-called no shows who are unable to attend the courses. No shows are most frequently attributed to changes in operating schedules.

d. COMNAVAIRLANT requires that all repair party and in-port fire-fighting party members attend the five-day fire-fighting course, all air department personnel attend a three-day course, and half the ship's company attend a two-day fire-fighting course. In FY '67, no air-group personnel attended basic or refresher fire-fighting courses.

RECOMMENDATION #5-2 RATIONALE: (Cont'd)

e. CONTRALANT schools are able to meet about 32% of the NAVAIRLANT requirements.

3. About 25% of the USS ORISKANY crew and apparently none of the Air Wing personnel had received fire-fighting training prior to the October 1966 fire. Only 150 personnel were trained in the use of the OBA. (ORISKANY Investigation Report) On USS FORRESTAL about 50% of the crew and none of the Air Wing personnel had fire-fighting training prior to the fire. (FORRESTAL Investigation Report) Both reports of these incidents recommended full-crew training in fire-fighting.

4. During both the CONTRAPAC and CONTRALANT briefings, it was indicated that the training capacity of existing facilities could be substantially increased by the addition of more instructors. For example, the Fleet Training Center, San Diego two-day fire-fighting course could be increased 80% with nine more instructors and the five-day course could be increased 50% with three more instructors. Although it is recognized that fleet-wide demands for new billets always exceed the resources available, this appears to be an area worthy of careful scrutiny and high priority.

5. An increase in shore based facilities is not, however, the whole answer to the problem. While stateside, operating schedules sometimes make it impractical to fully utilize the schools. Deployed units, of course, are denied the use of the facilities. Hence, the shore based facilities must be augmented by mobile training teams in order to fully meet the need. The inefficiency of this training method is recognized; however, it is felt that on large ships such as carriers, through careful scheduling, instructor utilization could be maximized.

6. The resources available in other activities should not be overlooked. Naval Air Stations and Naval Shipyards are two potential sources of additional fire-fighting training. Finally, if the capability is not available in-house, consideration should be given to hiring outside activities such as the Underwriters Laboratory, Municipal Fire Departments and the like to establish and monitor training.

RECOMMENDATION #5-3 Damage Control Training of Carrier PCO's

Prospective commanding officers of CVA's be required to complete a course in damage control prior to assuming command. The course should include basic principles of ship damage control, a review of past carrier incidents and damage reports, including combat damage, and observation of and participation in actual fire fighting and damage control training exercises. Proposed cognizance: OPNAV, BUPERS, FLEET COMMANDS

RATIONALE:

1. Aboard carriers, neither the Chief Engineer nor Damage Control Assistant (DCA) billet is a 1300 designator. Thus, few carrier commanding officers have had any actual experience or practical background in damage control because of their career pattern of previous duties. This lack of experience in damage control on the part of the commanding officer is most critically reflected in a generally low level of command interest in damage control matters, and a failure to appreciate the importance of damage control training. Regardless of the enthusiasm and ability of the DCA, ship-controlling drills in damage control are not going to be included in an already-too-full schedule, unless the commanding officer recognizes the importance of damage control and the necessity for continued damage control training. This state of affairs is apparent from carrier refresher training reports (briefing by LCdr (b) (6) -CVA Refresher Training) and inspections. (Inspector General LANTFLT Report on Damage Control Readiness in LANTFLT Carriers, see Bibliography, Annex C)

2. Prospective carrier commanding officers (PCO) are now ordered by BUPERS to duty at the type commanders headquarters for about two months before relieving. The proposed course in damage control could be accomplished during this period and would serve to provide the PCO with an appreciation of the potential hazards to his future command, and the means at his disposal to protect the ship.

RECOMMENDATION #3-4 Certification of Ordnance Personnel

Ordnance personnel be certified in writing as being qualified to assemble, load, arm, disarm or download individual items of ammunition, and that this qualification be demonstrated periodically before a command-instituted board to maintain certification. Proposed cognizance: OPNAV

RATIONALE:

1. The USAF requires that all ordnance-loading personnel be certified in writing that they have met certain minimum training requirements. Qualification certification is made after a written examination and loading demonstration has been successfully completed before a command appointed examining board. Proficiency checks are conducted every six months by a standardization inspector. (Briefing by Col (b) (6), USAF, Air Force Explosive Safety Philosophy).

2. The aviation ordnancemen who perform this same function on naval aircraft are in the main equally as well qualified as their Air Force contemporaries. Squadron ordnance personnel attend formal courses covering the weapons to be employed by their squadrons while they are training in CONUS. Each squadron is required to undergo and achieve a successful grade in a Conventional Weapons Technical Proficiency Inspection.

3. A deficiency in the Navy system appears, when on a deployment the rotation of personnel incident to level readiness occurs. There is no safeguard to assure the squadron or air wing ordnance officer that his replacement personnel are fully qualified to perform their new duties. A second is the amalgamation of ordnancemen from several squadrons of dissimilar types to function as an air wing ordnance team. The individual ordnanceman may be called upon to service weapons in other squadrons' aircraft on which he was not trained.

4. It is suggested that conventional weapons qualifications of enlisted men be written into the service record of qualified personnel. This page 13 entry should state the type aircraft and type ordnance on which the man is qualified to work on and to load.

RECOMMENDATION #5-5 En Route Training For Enlisted Personnel

Enlisted personnel receive specialized training including environmental and survival training for first term personnel while en route to CVAs, rather than during the carriers' training and work-up periods. Proposed cognizance: BUPERS

RATIONALE:

1. Under the current concepts of level readiness, the turnover of personnel aboard carriers is a continuing process. Drafts of enlisted men arrive aboard carriers during combat operations in the Gulf of Tonkin. It is conceivable that a man would be exposed to a fire, explosion, or other shipboard emergency immediately after reporting aboard, yet there is no provision for fire-fighting or personal-survival training (OBA, abandon ship, etc.) for enlisted personnel until after the man has reported to his command.

2. Formal training of personnel while a carrier is deployed is difficult at best, and impossible for some courses (e.g. Fire fighting) due to the limitations or nonavailability of shipboard facilities. Space for classrooms is almost nonexistent. For example, mess decks that are used as classrooms during peacetime cruises are now used as bomb assembly areas. Ready rooms are now manned almost 24 hours per day by flight crews. During combat evolutions, the working day is necessarily long and there is little time available for formal training periods. During in-port periods, considerations of crew morale militate against a heavy training effort.

3. The carrier's operational training and work-up period is intended to develop the total ship's performance as a team. If large drafts of men are absent from these at-sea training periods to attend fire-fighting school or specialized equipment maintenance courses, for example, the objective of team training is immediately defeated.

4. The concept visualized in this recommendation is parallel to the level readiness function of the replacement air wing. First term enlisted men would attend fleet training group courses in generalized areas such as fire fighting, damage control, first aid, swimming, etc. to enhance their ability to survive in the shipboard environment. Similarly, experienced petty officers would take advantage of specialized NATTC, BuPers, or Fleet courses which would contribute to their performance in rate and their knowledge of the equipments installed on ship to which they are to report.

RECOMMENDATION #5-6 Weapon Training Devices

Requirements be established for the procurement of inert weapons and weapons training devices, and that these devices be delivered in advance of the introduction of the associated weapon into the fleet. Proposed cognizance: NAVMAT

RATIONALE:

1. Introduction into the fleet of new and increasingly complex weapons, and the high rate of turnover of personnel has greatly emphasized the need for personnel training as well as the importance of devices that are required to properly support this training.

2. During the Panel's August 1967 visit to CVA's on Yankee Station; ship, staff, and Air Wing officers stressed the absence of, and need for training devices (Brief presented to Panel during August 1967 WestPac visit, by Operations Officer, Carrier Division Seven). In particular, they addressed the requirement for training aids to be made available prior to the introduction of new weapons to fleet users. A few of the devices requested are:

a. Inert weapons for familiarization and to practice strike down/up, aircraft arming/dearming and handling.

b. Cutaways and visual aids of complete weapons and certain components, such as fuzes, for familiarization and practice in assembling, arming and dearming.

c. Test equipment, harnesses, racks and launchers for practice in testing and marrying weapons to aircraft.

3. Increased emphasis must be placed on providing specific training devices for each weapon prior to the introduction of that weapon into the fleet.

RECOMMENDATION #5-7 Increased Emphasis on Damage Control

Increased emphasis be given to damage control training throughout the Navy, including OCS, NROTC, U.S. Naval Academy, and the Naval Air Training Command. Proposed cognizance: BUPERS

RATIONALE:

1. Other recommendations have dealt with improved damage control resources management and training in the fleet. To support a revitalized damage control program in the fleet, it is essentail that line officers possess a sound education in the fundamentals of damage control and practical training in its applications.

2. From the investigations of the Panel it is evident that a large segment of new officers entering the fleet today are receiving little practical training in damage control.

a. Naval Academy and NROTC graduates receive little if any training in practical damage control, fire fighting or shipboard survival before reporting to the fleet for duty.

b. No damage control, fire fighting, or shipboard survival training is taught to student officers or officer candidates in the Naval Air Training Command.

c. Naval Academy Midshipmen are now required to take an academic course in the principles of damage control. However a recent decision has been made to discontinue this course at the Naval Academy.

3. To achieve an increased emphasis on Navy wide damage control training, it is necessary that the officers who will be responsible for this effort, be themselves, educated in the fundamentals and trained in the practical aspects of this subject.

RECOMMENDATION #5-8 Training Aids

Improved training aids on damage control (including a film on the USS FORRESTAL fire prepared from available PLAT and hand-held camera footage) be prepared and provided to all CVA's. Proposed cognizance: OPNAV, NAVMAT

RATIONALE:

1. Effective shipboard training for damage control personnel is hampered by a lack of realism. For example, the simulation of a major conflagration aboard ship is not only impractical but imprudent. Hence, the ship must rely almost entirely on training aids in order to give the damage control personnel a feeling for tasks they may be required to perform.

2. Movies are a most effective device. A documentary film of the FORRESTAL fire which combines both the Pilot Landing Aid Television (PLAT) film and the hand-held camera film would certainly convey a message to carrier damage control personnel. Such a film would of course require careful editing and an accompanying commentary which is tastefully prepared.

3. Well known training aids which have been successfully employed in other programs could be utilized such as Sense Pamphlets, flash cards, posters, personal notebooks and the like. In addition diagrams of escape routes could be printed for individual ships. An effective and safe smoke generator for Oxygen Breathing Apparatus and Escape Breathing Device training should be developed.

4. There is within the Training Commands and Schools Commands the expertise to produce an effective training aid kit for use aboard the carriers. A program to produce such a package would pay dividends in improved shipboard training.

RECOMMENDATION #6-1 CVA Munitions Load-out Certification

The certification of air launched weapons for shipboard use and the authorization for individual carriers to load and employ specific weapons be formalized by the publication of a Weapons Stowage and Handling Manual which shall be updated as required to provide for the introduction of new weapons. Proposed cognizance: NAVMAT

RATIONALE:

1. For each new CVA, a Weapons Stowage and Handling Manual is produced by the contractor. This manual includes text, illustrations, photographs and plans covering the detailed description of each step of the shipboard handling procedures required for replenishment, check out, maintenance and stowage of weapons. (Specifications for Building CVAN 68) Ships on which Improved Rearming Rates Program (IRRP) modifications are accomplished will receive similar manuals.

2. This manual describes the optimum stowage plans, handling routes and the capabilities of installed equipment. It represents the best way to achieve maximum replenishment and rearming rates. Stowage plans consider the latest in safety requirements for new weapons as well as the requirements of OP 4 and OP 2043.

3. No effort is made to modify or update this manual. As the ship gets older and alterations are installed, stowages and handling equipments change. A more important factor resulting in the gradual obsolescence of this manual is the introduction of new weapons which are not covered in the original version.

4. During the development of new weapons, ship suitability tests are run. From time to time, Naval Ordnance Systems Support Office, Atlantic (NOSSOLANT) or Naval Ordnance Systems Support Office, Pacific (NOSSOPAC) conduct inspections of the magazines. The prime purpose of the suitability tests is to certify the weapon for fleet introduction. No such certification is conducted for individual ships. As a result, the Type Commander, assisted by the Ship's Weapons Officer, must certify the ship to carry a particular load. (NAVAIRPAC Brief)

5. The Weapons Stowage and Handling Manual provides a vehicle whereby the cognizant personnel in the Systems Commands can certify individual ship magazines and handling systems for new weapons as they are introduced. Hopefully, revisions to the manual would precede introduction of the weapon and would thereby qualify the individual ship for load-out. This procedure would place the burden of any decision regarding the safety of the stowage or handling system squarely on the technical people qualified to make it.

6. For ships not holding these manuals, it is proposed that the manual be prepared and published during the ship's next shipyard availability.

RECOMMENDATION #6-2 Handbooks

Advanced handbook technology including standardized format, symbology, and terminology be utilized in the preparation of aircraft and weapon manuals to meet the environmental conditions of fleet use. Proposed cognizance: NAVMAT

RATIONALE:

1. Information on system operation, assembly, maintenance, and check-out is provided to the user in the form of handbooks provided by the system developer.

2. There currently exist at least three different policies on handbooks including format, style, terminology and symbology, packaging, procurement, delivery, and responsibility. There is no R&D base for improved manuals, nor is there a test and evaluation procedure. (Discussions with AIRSYSCOM, ORDSYSCOM and SHIPSYSCOM, NAVC Brief)

3. As a result, the Fleet is confronted with a plethora of manuals and handbooks of considerably less than desired quality. Common deficiencies are:

a. Conflicting instructions (among different manuals)

b. Late arrival (after the equipment they are intended to support)

c. Inappropriate size and construction for use in the intended environment

d. Not current (no updating)

e. Written in a style unintelligible to the intended reader

f. Unreadable under the ambient light conditions intended. (Red printing on manuals to be used in darkened spaced at night) For example, the information needed to load MK 81 and MK 82 general purpose bombs on an A-4 aircraft is contained in 22 different publications. (Briefs by NATC, NWC, FOL/WO, discussions with Weapons Officers on Yankee Station, COMNAVAIRLANT ltr to CNO (WAL 5243 ser 0976 of 18 Nov 66, CINCPACFLT msg 140027Z Sep 67)

4. The manuals utilize outdated techniques and training methodology. The Navy has developed the Symbolic Integrated Maintenance System (SIMS) and the USAF has developed the Presentation of Information for Maintenance and Operation (PIMO). Both promise significant decreases in errors and performance time with improved readability and user acceptance. A recent bibliography ("An Annotated Bibliography on the Design of Instructional Systems", OSCR&D, USA; HUMRRO TR 67-5 dated May 1967) reviewed the progress in new technology. The potential improvements within the state-of-the-art are significant.

RECOMMENDATION 76-2 RATIONALE (Cont'd)

5. Interfaces of different systems commands' material, and hence their handbooks, present problems. Aviation ordnance is handled by ships personnel and stored in ships' magazines. Damage control of aviation ordnance is also the responsibility of the ships company. Yet the manuals from each equipment-originating-material-command, often do not consider other subsystems or users. (NATC, NMC, personnel on Yankee Station, Human Factors Brief)

6. Manuals should be standardized, human engineered and responsive to the operational situation.

RECOMMENDATION #6-3 Weapons Damage Control Procedures

Safety procedures and damage control considerations for each weapon be established and promulgated with weapons handbooks. Proposed cognizance: NAVMAT

RATIONALE:

1. Information relative to the hazards associated with weapons and weapons systems is very meager or completely lacking in the documentation furnished the fleet units. During discussions with ordnance and damage control personnel aboard the CVAs in SEASIA by members of the Panel, it was determined that they were not aware of the speed of the reaction to fire of explosives and propellants, nor of the very short time available to carry out an effective damage control operation. They were uninformed of the essential importance of immediately putting cooling water on explosives exposed to fire. Although it is known that a bucket of water applied to an ignited MK 24 Flare will extinguish the blaze (CONTRAPAC Demonstration), such information was not generally known in the CVAs in SEASIA nor is it promulgated in the MK 24 Flare manuals. (The instruction sheet packed with each MK 24 Flare states in red print - "Its flame will melt steel and cannot be extinguished")

2. Damage control procedures, and data on some safety hazards associated with weapons and weapons systems, usually exist. There is no established requirement to include this information in the weapons handbook, therefore it is not being done; and operating personnel have little knowledge of this kind of data. It was recommended to the Panel during the SEASIA visit and during presentations that explosives and fire hazards, and damage control procedures, where applicable, for all weapons and weapons systems be included in operation and maintenance manuals.

RECOMMENDATION #6-4 Safety Requirement in Technical Development Plan (TDP).

The instructions governing the preparation of Technical Development Plans (TDP) be modified to require a mandatory safety program for all weapons developments, and that any departure from the approved TDP safety program be authorized in writing by OPNAV. Proposed cognizance: OPNAV, NAVMAT

RATIONALE:

1. The instructions governing the preparation of Technical Development Plans (TDP) is the primary vehicle for conveying the details of Research and Development (R&D) activity necessary to achieve a desired end product. It responds to a Specific Operational Requirement (SOR) or Advanced Development Objective (ADO), and serves as a basic decision-making document at all management levels. It is the primary management control for the life of a development project. The directive which provides the guidance for the preparation, submission, review, approval and implementation of TDPs is OPNAV INSTRUCTION 3910.4C dated 12 May 1967. The essential content of all TDPs include:

a. A narrative statement of the requirement.
b. A brief development plan.
c. Delineation of performance characteristics.
d. Delineation of reliability characteristics and plans for achievement.
e. Delineation of maintainability characteristics and plans for achievement.
f. Graphic presentation of time scheduling.
g. A financial plan for the development.
h. A summary of compatibility and commonality of command, control and communication components with systems of other agencies.

2. Although OPNAV INSTRUCTION 3910.4C does imply that all performance and reliability characteristics, including safety, be addressed in the TDP, it is believed that many of the TDPs are not fully complying with this directive. (Brief on STANDARD ARM by Capt E. B. Boutwell/observations of Panel members from an inspection of TDP on STANDARD ARM and other weapons).

3. Safety cannot be neglected in the design of munitions. The ORISKANY and FORRESTAL fires were both caused, or contributed to, by poorly designed ordnance equipment. (ORISKANY and FORRESTAL Informal Investigation Reports.) Safety can be enhanced by emphasizing that this subject must be addressed in the TDP.

RECOMMENDATION #6-5 Aviation Ordnance Accident/Incident Information

Aviation ordnance accident/incident information be published to the fleet by the Naval Aviation Safety Center (NAVAVSAFCEN) in existing aviation safety publications for the purpose of apprizing the fleet of possible ordnance problems. Proposed cognizance: OPNAV, LANTFLT/PACFLT

RATIONALE:

1. The dissemination of aviation ordnance accident, incident, and malfunction information gathered in response to Bureps Inst. 8020.6B is not being carried out. Information gleaned from the Panel's interviews and briefings reveals that a number of significant accidental firings of flares and rockets occurred prior to both the ORISKANY and FORRESTAL accidents, yet the particulars of these firings were apparently not disseminated. Regular dissemination of this type of information will help to prevent complacency on the part of supervisory personnel and will focus their attention on particularly troublesome ordnance. The use of NAVAVSAFCEN publications produced for pilot/senior maintenance personnel will contribute materially to proper dissemination of this much needed information.

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RECOMMENDATION #7-1 CVW/Squadron Aviation Ordnance Officers

Limited Duty Officers (LDOs) and Warrant Officers (WOs) with aviation ordnance background (instead of electronics, for example) be assigned to fleet units on a relative priority system, with Attack Carrier Air Wing Staff Ordnance Officer billets being filled first and subsequent assets equitably distributed to provide 50%, or more, of the Squadron Ordnance Officer billets within any given air wing with such specialists. Proposed cognizance: BUPERS

RATIONALE:

1. Almost all CVW squadron ordnance officers are inexperienced in aviation ordnance. Most are junior officers with no prior squadron experience with the exception of a few LDOs and WOs, who, as a rule, have electronics rather than ordnance backgrounds. (Conversations between Capt R. E. McCall and the following carrier Air Wing ordnance officers during visits to Yankee Station: Lt (b) (6), CVW-10 aboard CVS-11; Lt (b) (6), CVW-16 aboard CVA-34; Lt (b) (6), CVW-15 aboard CVA-43; and Lt (b) (6), CVW-14 aboard CVA-64.)

2. Today there are 41 types of bombs, 10 types of missiles, 9 types of mines, 8 types of flares, and 5 types of 20MM ammunition that may be carried aboard a CVA. These weapons are launched from many different types of launchers and racks and may be fuzed in several different ways. In addition, there are literally hundreds of publications and check lists which apply. (NAVAIRSYSCOM message 182118Z of August 1967 lists twenty publications which pertain to the LAU/10/A ZUNI rocket launcher.)

3. The complexity of these weapons and the need for absolute perfection dictate that only the highest caliber officer with ordnance experience be detailed to these important billets. Priority should be given to attack-carrier air wing staff and squadron ordnance officer billets even at the expense of taking qualified officers from non-CVA aviation units or from surface units.

RECOMMENDATION #7-2 Increased Allowance for DC and EOD Supervisory Personnel

The allowance of damage control and explosive ordnance disposal supervisory personnel for CVAs be increased as follows:

	Present	Proposed
Warrant Carpenter	1	2
Damage Control CPO	2	4
Explosive Ordnance Disposal Officer	1	1
Explosive Ordnance Disposal Petty Officers	2	4

Proposed cognizance: BUPERS

RATIONALE:

1. The consensus of Yankee Station CVA commanding officers is that safety would be greatly enhanced by increasing the allowance of supervisory damage control and explosive ordnance disposal personnel. The tempo of operations requires around-the-clock supervision in these two important areas. Both must be able to respond to emergencies immediately, regardless of the time of day. With the constant break-out, strike-up, and assembly of munitions, there are more opportunities for situations requiring the services of EOD personnel, and with more night work there is an increased probability of fire. In both situations, the very survival of the ship may depend on the initial action taken and the speed with which the action was originated.

RECOMMENDATION #7-3 Shore Duty Billets for Ordnance Personnel

Enlisted ordnance billets at Naval Weapon Centers, Naval Magazines and Naval Ammunition Depots be retained in order that enlisted personnel may work within their ratings while on shore duty. This will maintain personal expertise and enhance carrier safety in subsequent assignments. Billets are now undergoing civilian substitution. Proposed cognizance: OPNAV

RATIONALE:

1. Many of the billets for enlisted ordnance personnel at Naval Weapons Centers, Naval Ammunition Depots and Naval Magazines are in the process of civilian substitution. (Briefing by CO NWS Seal Beach, Fallbrook Annex on 7 September 1967.) The NWS Seal Beach, Fallbrook Annex is responsible for receipt, test, assembly, storage, renovation and issue of the following missiles: SHRIKE, SIDEWINDER, SPARROW, BULLPUP B/C, WALLEYE, STANDARD ARM and AQM-37 (DRONE). In the future they will also be responsible for PHOENIX and CONDOR. Much of the inspection and assembly of missiles is now done by enlisted men, who, upon completion of a tour of shore duty, return to sea duty with a great amount of knowledge about these systems. Essentially, all this good training and knowledge will be wasted when enlisted billets undergo civilian substitution.

2. The Navy cannot afford to disestablish these billets with consequent assignment of these important ratings to shore duty in general service billets such as shore patrolmen or Masters-at-arms. Continuation of these ordnance billets will provide better qualified personnel to the Fleet thereby contributing to an improved level of Readiness. If these billets are terminated, a good source of training toward the Warrant Officer and Limited Duty Officer programs will be eliminated.

RECOMMENDATION #7-4 Tour Length for CVA CO

Tour lengths of attack carrier commanding officers be extended to about eighteen months to achieve greater command stability and continuity.

Proposed cognizance: BUPERS

RATIONALE:

1. With the exception of nuclear powered ships, commanding officers of attack carriers are programmed for a year's tour. In many cases the actual period of command is even less than 12 months. A recent commanding officer of the USS RANGER served in that capacity for only four months.

2. It is generally agreed that six to eight months are required for a new carrier commanding officer to learn his ship, his people and the operations. It is only after this learning period that the average commanding officer is able to take a productive role in advancing the state of the art of carrier warfare. Up to this point, his energies are consumed by the day to day affairs of ship operations and administration, which although routine for the ship, are a new experience for the commanding officer. As the commanding officer gains experience through exposure and time in his duties, he becomes more efficient, and this efficiency and confidence are reflected in the performance of the entire crew.

3. The change of command aboard a carrier is always followed by a reorientation within the ship to the policies and attitudes of the new commanding officer. Subordinates must first determine what these new policies are and then reeducate their personnel. This can be an unsettling process before stability is reachieved. Although such changes can normally be accommodated with ease in peacetime, they constitute an additional burden under the current conditions of high tempo of operations, when the pressures on the crew are already approaching the limits of toleration.

4. Without exception, the former attack-carrier commanders with whom this matter was discussed, all agreed that the 12 month tour in command was well short of the optimum length. Most felt that eighteen months was probably the ideal term, and that the stresses of command over this length of time would impose no abnormal physical or mental strain on the commanding officer.

RECOMMENDATION #7-5 Human Performance Measurement

An advanced development project be established to determine measures and indices of human fatigue and performance decrement which can be used to predict human breakdown or risk of human error under operational conditions. Proposed cognizance: NAVMAT

RATIONALE:

1. Heavy operational commitments, increased weapon load capability of aircraft, high deck multiples, increased maintenance requirements from greater system sophistication, and shorter cycle times, which have been brought about by high-speed jet aircraft, have all led to increased demands from the man. Available manpower which is limited, both qualitatively and quantitatively, and CVA environmental limitations have placed further demands on each man in the system. Utilization of man's reserve resources has permitted continued operation without increasing the CVA allowance in proportion to the increased workload. It has become clear that the effort required by cyclic operations on Yankee Station approaches the limit of the human being, including his reserve capacity. (Briefings by CINCPACFT, NAVAIRPAC, NAVAIRLANT and Department Heads on CVAs in WestPac.)

2. During the Panel's WestPac visit there was much evidence of the growing concern on the part of senior commanders with the safety aspects affected by the high-tempo on Yankee Station. That this concern is intuitive rather than measured presents a real problem. The intuitive mind may tell the commander that he may push his men a little further but the proximity to unknown risk, or even catastrophic failures, is not accurately known.

3. Recent advances in objective performance-measurement techniques appear to indicate that usable indices of performance degradation or fatigue are feasible. Measurement techniques which do not interfere with aircraft or ship operations can be employed.

4. The most promising measures for validation are:

a. Carrier landing and weapon delivery accumulated errors resulting from fatigue and combat stress.

b. Task concentration measurements based on the narrowing of perception and peripheral vision such as is seen in the man pushing the bomb cart after ten hours of loading.

c. Communication analysis.

d. Rest cycles analysis.

RECOMMENDATION #7-5 RATIONALE: (Cont'd)

e. Body chemistry changes.

f. Error increases.

5. The project should be directed toward the investigation of those measures or indices which provide command with estimates of current risk, reserve remaining, and the probable results of sustained effort.

DECLASSIFIED

RECOMMENDATION #8-1 Standard Fire Fighting Organization and Doctrine for CVAs

A standard fire fighting organization and doctrine be established for carriers, based upon the most successful fleet practice and experience, and that this organization and doctrine be prescribed in the AIRLANT/AIRPAC CV Instruction. Proposed cognizance: OPNAV

RATIONALE:

1. No two of the five CVAs visited by the Panel have similar organizations or doctrines for fighting fires either underway or in port. The sizes of the fire parties vary considerably and so does the equipment taken to the scene of the fire. One ship uses a "Flying Squad" of 17 so-called professionals to respond to every fire alarm. Another ship uses the same idea of a professional fire team but the number of men who respond depends on whether the fire is one alarm, two alarm or three alarm. On yet another ship, the procedure is to man all repair lockers and to go to General Quarters if the fire is not reported under control in three minutes.

2. The above procedures have evolved as the result of experiences on each CVA and each has some degree of merit. The key to containing a fire involving explosive ordnance lies in the rapidity with which initial fire fighting efforts are instituted and on equipments and techniques employed. Until such time as improved fire fighting facilities are installed in carriers, it is vitally important that fire fighting organizations and equipments be utilized in the most effective manner.

RECOMMENDATION #8-2 Responsibilities of Air Officer and Damage Control Assistant

Battle Control (NWIP 50-1(B)) be revised to define the operational authority and responsibility of the Air Officer and his assistants with regard to fire fighting on flight and hangar decks, with particular attention to the interfaces with the Damage Control Assistant (DCA). Proposed cognizance: OPNAV

RATIONALE:

1. There is no clear definition in NWIP 50-1(B) of the Operational authority and responsibility of the Air Officer or his assistants in regard to fighting fires in air department spaces and the interface of their responsibilities with those of the damage control assistant. On each CVA there is usually a difference of opinion between the Air Officer and the DCA as to their responsibilities. It is generally agreed that the Air Officer is responsible for "touting" fires in aircraft. There is no delineation of the DCA's responsibilities, however, for fighting fires not in aircraft which occur in air department spaces, or in "major" aircraft fires or disasters. Neither is there a clear understanding as to who has final responsibility for the maintenance, material condition or replacement of damage control equipment assigned to the air department.

RECOMMENDATION #8-3 Duties of Crash and Salvage Crews

Procedures of the Air Department of aircraft carriers be revised so as to eliminate the practice of requiring members of the Crash and Salvage Crews to operate tow tractors during start, launch, and recovery operations. Proposed cognizance: LANTFLT/PACFLT

RATIONALE:

1. During the initial and critical moments of the July 1967 FORRESTAL fire, the immediate fire-fighting capability of the Air Department was diluted by the requirement for personnel of the Crash and Salvage Crew to operate tow tractors. The assignment of this second responsibility is common on most carriers because of limited manpower resources aboard ship.

2. Currently installed fog foam stations are capable of providing foam to the flight deck level in as little as 15 seconds after activation. However, this fire fighting system can only be fully effective if strategically spaced outlets are actively manned by qualified personnel. Significantly, just prior to the FORRESTAL fire, many of the fire fighting crew were, in fact, carrying out their secondary tractor-driving assignments (FORRESTAL Investigation Report, Volume 5). As a result, the men were not instantly available to carry out their primary fire fighting duties.

3. All carriers should immediately restrict Crash and Salvage Crew members from tractor-driving responsibilities during aircraft start, launch and recovery operations. On board manpower resources, although acknowledged to be limited, should be diverted from other Divisions and Departments and assigned to the Flight Deck Division (V-1) as necessary.

RECOMMENDATION #8-4 Condition Zebra During General Quarters

Battle Control (NWIP-50-1(B)) be revised to reflect the access requirements of aircraft maintenance personnel during general quarters, thus determining a realistic number of ZEBRA closures which may remain open for servicing aircraft. The requirement for a material condition to be set when the ship is at flight quarters, but not at general quarters, should also be specified in NWIP 50-1(B). Proposed cognizance: OPNAV

RATIONALE:

1. Battle Control (NWIP 50-1(B)) requires that when condition Zebra is set, no more than seven (7) Zebra closures for each A, B, or C section of the ship may be open at any one time. The Panel found on the West Pac trip that this requirement is not adhered to aboard the carriers operating with Task Force-77 because seven open Zebra fittings do not provide adequate access for air wing, air department and weapons department personnel to perform their tasks, aircraft handling and maintenance. In other words, the carrier could not conduct air operations with condition Zebra set as prescribed.

2. This incompatibility of flight operations with maximum ship protection is an unacceptable situation because it is difficult to conceive of a high threat circumstance in which air operations will not be an absolute necessity. In the training environment, the inability to comply with the requirements of NWIP-50-1(B) inculcates bad habits or conveys a false impression of the ships real battle control readiness or material integrity. (Briefing: Damage Control, Ready or Not by Cdr (b) (6))

RECOMMENDATION #8: Hazardous Material Control

A central group be established for the dissemination of information, monitoring of research efforts, and furnishing rapid response to the Fleet on matters concerning the identification, control, handling and stowage of dangerous materials aboard ship. Further, that an informal newsletter which discusses these materials be published on a monthly basis and be similar in format to the Aviation Safety Bulletin. Particular emphasis should be placed on the behavior of materials, commonly considered safe, when they are subjected to special environments (including fires) that may be encountered aboard ship. The publication should be designed to keep Commanding Officers, Executive Officers, Engineer Officers, and their subordinates, well informed. Proposed cognizance: NAVMAT

RATIONALE:

1. A hazardous materials study group was established by the Chief of Naval Material in January 1967. The group was assigned the task of studying the marking, handling, transfer and storage of hazardous materials (excluding ammunition) used on board ship.

2. A briefing conducted by members of this study group revealed that no uniform Navy-wide qualification requirements or detailed technical information on characteristics of materials used on board ships is now published to the Fleet. Because of this, it was recommended by this group that a Dangerous Materials Center be established. In addition, the group set certain research and development goals which have not been fully funded.

3. There are many research organizations involved in material research. These include the Naval Research Laboratory, Naval Ship Research and Development Center, Applied Science Laboratory, Naval Radiological Defense Laboratory, U.S. Naval Ordnance Laboratory, and the U.S. Naval Medical Center. In addition, many other agencies outside the Navy conduct research in the chemistry and toxicology of materials.

4. On the ResPac visit to carriers operating on Yankee Station it was found that the fins on some bombs were coated with a paint which gave off toxic vapors at temperatures encountered in the magazines of carriers operating in the SEASIA climate. It was also found that many new lacquers and solvents are being used for aircraft maintenance. Although this fact had been known for some time, it was not until the Mills Committee Report (Mills Committee Report and Follow-up Action, briefing by NAVSHIPS) that action was taken to provide the additional storage required for these materials.

5. The fire in FRANKLIN D. ROOSEVELT was attributed to calcium hypochlorite (laundry bleach) coming in contact with a hydrocarbon paint. This material was improperly packaged (plastic containers) and improperly handled. The installed handling system aboard FDR, consisting of a net and hoist, undoubtedly contributed to the accident. (FDR Investigation Report)

RECOMMENDATION #8-5 RATIONALE (Cont'd)

6. It is not enough to identify the characteristics of a material in ascertaining whether it presents a hazard in shipboard use. Quantity and environment must be considered. For example, with the ship closed up under BW/CW attack, engine rooms and fire rooms will probably reach temperatures in excess of the flash point of Navy Standard Fuel Oil (NSFO) or JP-5. In fact, the pump rooms and main machinery spaces of CVAs in SEASIA are today exceeding 140° with all ventilation operating.

7. Fire-retardant paint loses much of its fire-retardance property as the paint film becomes thicker. Hence, NAVSHIPS Manual specifies that paint should be removed prior to repainting if the average thickness exceeds 5 mils. There are few carriers which, if subjected to a vigorous inspection of paint coatings, would not fail inspection (Toxicity and Fire Hazards). Although there is no reason to suspect this actually occurred on FORRESTAL, the possibility exists that the chlorinated alkyd paints used to coat interior compartments could give off lethal doses of hydrochloric acid in a severe conflagration (Toxicity and Fire Hazards Associated with Shipboard Materials, NRL Report 1816).

8. In addition to the paints, the shipboard habitability improvements have added fluorescent lights, deck coverings, foam mattresses, and aluminum furniture which should be included in considering shipboard materials.

9. A central group to monitor dangerous materials with a publication which addresses problems associated with these materials, and in particular the behavior of common materials in special environments such as fire, would assist Fleet personnel. Such a publication could also foster the exchange of information and ideas which is a prime requisite of a program of this type.

RECOMMENDATION #8-6 Human Factors Program

An effective human factors program be established at all RDT&E levels, including laboratories and field activities, to insure that systems are designed for effective operation by Naval personnel. Proposed cognizance: NAVMAT

RATIONALE:

1. The full impact of inadequate human factors design of weapon systems has been amply documented in the reports of investigations of the fires aboard the USS ORISKANY and the USS FORRESTAL. In both cases, inadequate human engineering of equipment was, or contributed to, the cause of the accident and the result. This lack of human factors engineering was further documented for the Panel at every level from ship (Human Factors Brief), to command (CINCPACFLT, COMNAVAIRLANT, COMNAVAIRPAC Briefs) to R&D laboratory (NMC, NOL WO, NWL Brief), to weapons test facilities (NMC, NATC Briefs), to discussions with material commands. Numerous examples of poor human factors design or engineering in attack carriers can be cited. A few follow:

a. High Capacity Fog Foam hose stations on the FORRESTAL vary in configuration from station to station. The physical relationship of the valve, actuating button, phone, and call button follow no established pattern. For some, the sound powered handsets are in boxes; at others the switches are in boxes.

b. The designs of the MK-24 Flare and the MK-36 Destructor lend themselves to accidental actuation. In both cases, the inadvertent actuation may not be immediately evident and, in both, it is equally difficult to resafety or arrest the action initiated.

c. Some aircraft ordnance rack safety pins and adapting cables are identical in appearance, and are physically but not functionally interchangeable. As a result, ordnance can be fired accidently if the wrong pin or cable is used. (Aero 7A, LAU-17, and MER/TER electrical safety pins; CBU, and rocket cables; MK-4 gun pod and fuel tank cables).

2. Following another tragic accident, USS THRESHER, the Navy undertook a systems analytic approach to submarines. It exposed weak areas from control station design to training to hardware and assembly. The resultant program called "Sub-Safe" has led to significant improvements in submarines. A similar and continuing program could be adopted to expose weak areas in attack carriers, air launched munitions, aircraft, and their design and integration.

3. To insure that the human side of the equation will be adequately considered in the design, development, and production of safe, operable, and effective attack carrier weapon systems, it is considered essential that a human factors program be established. Although a review of human facto

RECOMMENDATION #6-6 RATIONALE (Cont'd)

in R&D is underway at the Naval Material Command, it is considered that action to implement a program not be postponed pending the report of that review.

RECOMMENDATION #8-7 Damage Control Training Assistance

Damage control assistance teams under the control of the Air Type Commanders, conduct periodic visits to deployed carriers to evaluate damage control readiness and provide training assistance. Proposed cognizance: LANTFLT/PACFLT

RATIONALE:

1. Briefings by the Training Commands and Air Type Commanders of both fleets, the Training Division of OPNAV (Op-37), and reports of the Inspector General, U.S. Atlantic Fleet, and the Board of Inspection and Survey all have indicated the generally low state of damage control training and material readiness in carriers of both Fleets. Many of the Panel's recommendations and independent actions by Fleet commands and other naval activities have placed strong emphasis on all facets of damage control. The final actions and the ultimate results will, however, devolve to the carriers themselves. The Panel foresees an important need to assist the carriers in the implementation of the various damage control programs and to evaluate their effect on damage control readiness.

2. The general trend of damage control readiness in CVAs has been cyclic. From a high at the time of refresher training, readiness declines markedly through the period of deployment (Briefing at Training Command, Pacific). This is primarily due to the continuing turnover of personnel, and the failure of most carriers to conduct any sort of effective damage control training while deployed.

3. In the Panel's concept, and using Pacific Fleet carriers for illustration, a damage control assistance team would report aboard about the time of the carrier's initial line period, and again when the carrier is on the line about half-way through the WestPac deployment. The team's approach would be:

a. Inspect the material condition of installed damage control equipment and equipage items of allowance.

b. Review the ship's emergency bills and instructions relating to damage control, hazardous materials, etc., and the training records.

c. Brief the commanding officer on the results of the initial inspection and review.

d. Recommend to the commanding officer a feasible plan for conducting general drills in conjunction with regularly scheduled combat operations.

e. Provide the command with a suitable battle problem for use during general drills conducted on the line.

f. Act as observers during battle problems.

g. Train a ship's battle problem and general emergency drill observation team.

h. Evaluate the damage control readiness of the ship based upon the material condition, state of training, and performance in drills and problems.

i. Report the state of damage control readiness to the type commander.

j. Provide the command with a critique based upon their inspection, review, and observation.

4. The Panel proposes that the type commander's teams be augmented by technical experts from the Systems Commands. This approach would have an ancillary benefit in that material design deficiencies could be observed first hand by personnel with responsibility for their correction.

RECOMMENDATION #8-8 Ordnance Safety Observers

Ordnance Safety Observers be temporarily assigned to each Seventh Fleet CVA during the carrier's first combat operating period of the deployment, to observe ordnance handling and to advise the commanding officer of unsafe practices. Proposed cognizance: PACFLT

RATIONALE:

1. The turnover of personnel aboard Pacific Fleet CVA's between combat deployments to WestPac averages 40 to 60% of the embarked personnel (Briefing at COMNAVAIRPAC).

2. The total aviation ordnance training allowance provided to a CVA and embarked air wing prior to each WestPac deployment amounts to an equivalent of only about two days normal usage at Yankee Station. (COMNAVAIRPAC briefing)

3. When the CVA commences Yankee Team operations, ordnance personnel are suddenly subjected to sustained high-tempo operations. For as many as half of these men, it may be their first exposure to such an environment. The situation can be further complicated by the employment in quantity of new weapons which were not available during the training and work up periods. Inevitably, supervision and individual performance tends to break down under these conditions. Unsafe practices acquired during this first introduction to the tempo of combat operations, can remain as bad habits for the entire cruise unless detected and corrected early in the deployment. The function of the Safety Observer, as visualized by the Panel, is the early correction of ordnance malpractices.

4. It is suggested that the Safety Observer, a mature, relatively senior officer with aviation ordnance experience, be supported by a team of knowledgable enlisted personnel, and perhaps with some civilians representing the technical commands. The team would be aboard the CVA on its first period of Yankee Team operations of that cruise. Unsafe practices would be pointed out on the spot to violaters, and reported to the commanding officer and the responsible intermediate supervisors.

5. It would be desirable, within the limitations of manpower and time, to have the safety observers return periodically during a carriers deployment to evaluate the safety of ordnance handling.

RECOMMENDATION #9-1 CVA Damage Control Training Requirements

The Standard Training Requirement Manual for carriers be revised to require, in addition to exercises graded for the competitive cycle, a minimum of one general quarters drill per week at sea, and a prescribed minimum of supervised fire drills at sea or in port. Proposed cognizance: OPNAV

RATIONALE:

1. The Standard Training Requirement Manual specifies the number and type of drills or exercises which are to be required by each CVA during the competitive cycle. It does not, however, in most cases, specify the scheduling interval for conducting the drill. A certain degree of flexibility is necessary, of course, to allow the training schedule to adjust to the operating schedule. It is believed, however, that most of the drills are conducted during the short refresher training period rather than being spread over the entire competitive cycle. For the month immediately prior to the Panel's visit to Yankee Station, the average number of General Quarters (GQ) conducted was 1.4 per ship, but for the previous six months the average total number of GQs was 26.3. Some ships did not consider it possible to conduct GQ drills while on the line, without seriously hampering their ability to carry out air strike operations. As a consequence these ships often went several months without a GQ drill. Other ships as a matter of routine held GQ drills twice weekly during actual strike operations, thus demonstrating the feasibility of integrating drills into an operating schedule. It is considered that the proficiency of a crew in fire fighting and in setting Material Condition ZEBRA is highly important and must be maintained throughout a deployment.

2. It is believed that a minimum of one GQ drill per week would maintain this proficiency. The Panel has no feeling for the minimum number of fire drills required per week because of the difference in organization of the fire parties of each of the CVAs, which problem is addressed in Recommendation #8-1.

RECOMMENDATION #9-2 Ship Maneuvering During Fires

A treatise be prepared on the subject of maneuvering a carrier during fires or explosions to minimize damage and facilitate fire fighting and damage control measures. Because of the large number of factors which can be involved, this treatise should be in the form of a discussion of these many considerations and the possible effects of the different courses of action available to the conning officer. Proposed cognizance: OPNAV

RATIONALE:

1. None of the volumes on shiphandling currently available (Modern Seamanship - Knight; Naval Shiphandling - Crenshaw; Ship Handling - King and Noel) contains a discussion of maneuvering a carrier in the case of a flight deck crash, a fire, or explosion to minimize the damage to the ship and crew and to facilitate fire fighting and damage control measures.

2. Discussions with former carrier commanding officers led to the conclusion that, in general, the captain's plans for emergency maneuvering in the case of a fire or explosion were only as detailed or sophisticated as his own personal experience would allow. This kind of shiphandling appears to be lore gleaned from hard personal experience or word of mouth. Consequently, a commanding officer's reactions to a major fire or explosion early in his command tour, would probably be rudimentary or even exploratory in nature.

3. In World War II upon being hit and afire, carriers went into a tight turn to starboard which heeled the ship to port so that flaming airplane fuel was spilled off the port side of the flight deck and hangar and away from flight deck repair, ship control, and conflagration controls in the hangar. Fires were attacked from the high side, and worked toward the low. Turning the ship to port may bring the relative wind to starboard, but the heel to starboard may bring burning fuel to the island. The repair party, crash crane ("Tillie") and ammunition stowed by the island. Thus a turn through 270° to starboard might be better than a 90° turn to port to bring the relative wind on the starboard side. Obviously with a true wind of appreciable velocity a turn to starboard through 270° will put smoke over the island for a short time. Thus there is a trade-off between drainage of burning fuel and the temporary handicap of smoke covering the island, ship control and starboard side fire fighters.

4. Despite the lack of material in the shiphandling books concerning maneuvering during fires, there is considerable discussion of maneuvering during marine disasters contained in some of the less available source publications such as war damage reports, and reports of investigations of carrier fires and accidents. In addition, almost all commanding officers of carriers have well established ideas on the subject by the time they have completed their command assignments.

RECOMMENDATION #9-2 RATIONALE (Cont'd)

5. It is probably not possible to establish a single doctrine or set of rules which would apply across the broad spectrum of possible situations. However, a complete, detailed and well documented treatise discussing the various factors to be considered (wind, sea, heel, list, location of fire fighting stations, bomb cook-off times, use of foam versus water, ignition source provided by steam catapults in JP-5 deck spills, difficulty of moving heavy aircraft during heel, etc.) and the alternatives open to the conning officer, the on-the-scene fire fighter, and the Damage Control Assistant (DCA), would provide a comprehensive background from which the most effective judgments could be made.

RECOMMENDATION #9-3 CVA DECK MULTIPLE

Fleet Commanders review assigned CVA deck multiples to assure that they are realistic from the standpoint of safety of operations.
Proposed cognizance: LANT FLEET/PAC FLEET

RATIONALE:

1. CVA deck multiples are predicated on the maximum number of aircraft that a carrier can effectively operate. There is a prevalent opinion among ship's officers aboard YANKEE station CVAs that deck multiples are too high for safe operations, particularly during the beginning of a deployment. This opinion is voiced in the following excerpt from a memorandum written by an air officer of a Yankee Team CVA to his commanding officer:

"a. The desired deck multiple of 132-134 combined with the daily routine on Yankee station ... dictates an overly crowded spot for launch and a packed bow/safe park area from the completion of a recovery until midway through the next respot.

"b. Anytime we have a congested area, either flight or hangar deck, we are susceptible to a major conflagration such as FORRESTAL experienced. Closely parked aircraft hinder the movement of fire fighting equipment and severely reduce the probability of 'containing' a fire - the first cardinal rule of fighting flight or hangar deck fires ...."

2. High deck multiples restrict the ability of damage control and fire fighting personnel to cope effectively with conflagrations. Some of the more obvious areas of safety compromise are:

a. Fire lanes on hangar decks are non-existent, or of insufficient width, to allow fire parties to proceed expeditiously to the scene of the emergency. It is extremely difficult to transport fire-fighting apparatus over and under obstructions and to lead fire hose through the maze of closely packed aircraft and support equipment.

b. The close proximity of parked aircraft and the large numbers that will not be assigned for a given launch present a further consideration. In case of a conflagration, the aircraft must be moved away from the location of the fire to support the establishment of the fire boundary. Furthermore, the additional parked aircraft, numerous tie-down chains, low-slung ordnance, yellow rolling stock, and the hook farms all limit the capability to haul hoses from the catwalks to the scene of the fire. (Volume II FORRESTAL Investigation Report)

3. The number of aircraft moves required during each day of normal flight operations and aircraft maintenance spotting, is very demanding upon the aircraft-handling personnel. A high deck multiple places additional aircraft

onboard, and these must be constantly moved to accommodate such efforts. The result is greater crew fatigue, increased propensity for human error and personal injury. Also, the time required to shuffle aircraft to provide specific aircraft maintenance and turn-up spots, somewhat negates the aircraft availability for flight provided by the increased number of onboard aircraft.

4. In spite of operational considerations that encourage high deck multiples, a nominal decrease would obviously result in gains in maneuverability of the aircraft and accessibility to areas where conflagrations are most liable to occur.

ANNEX B -- BIBLIOGRAPHY

The Bibliography contains a listing of books, articles, reports and similar documents relevant to the areas of interest of the Panel and which were reviewed in the course of the Panel's work. A brief abstract is provided for each item. Special reference material not normally available in Navy technical libraries or correspondence files are retained in the Panel's files.

BIBLIOGRAPHY

AIR LAUNCHED WEAPONS

1. "Aircraft Bombs, Fuzes & Associated Components" by BUWEPS dated 1 August 1960, NAVWEPS OP 2216, Vol I and Conf Vol II

   Describes in detail bombs and fuzes from an Ordnanceman's standpoint. Also included are descriptions of adapter-boosters, igniters, arming wires, etc.

2. Aircraft Carrier Characteristics Chart by NAVAIR dated December 1966, SK No. 51-1134

   Tabulation of aircraft carrier detail characteristics including length, displacements, etc.

3. "Aircraft Fires, Research and Technology for Aircraft Fire Protection" by [redacted] dated June 1966, DDC AD 635605 66-17 ½

   Stresses the methods, materials, and techniques for effective prevention and control of fire, explosion, and hazardous vapors for aerospace flight vehicles.

4. Attach Carrier Fire Fighting Systems by Vice Admiral Connolly dated 22 August 1967, CNO Message 221206Z

   Outlines plans to introduce Light Water/PKP units to the Fleet.

5. "Aircraft Fire, Prevention of by Use of Foams in Aircraft Fuel Systems" (Firestone & Scott Paper), BUWEPS (Air Force Contract) dated March 1967, Technical Report AFAPL-TR-67-36, DDC AD 380877

   Experimental data are presented from small scale and full-scale experiments on the flame arrestor effectiveness of a polyurethane foam material. Tests were conducted which verified the effectiveness of the material for use in a full-packed aircraft fuel tank configuration at atmospheric pressure conditions.

6. "Aircraft Rockets" by BUWEPS dated 15 September 1966, NAVWEPS OP 2210, Vol I

Catalogs the various types of aircraft rockets and components and launchers. Gives assembly and disassembly procedures.

7. Accident/Incident Retrieval Systems Printout by NWL Dahlgren dated 23 August 1967

Descriptions of malfunctions of SIDEWINDER, 2.75" rockets, 5" rockets, SPARROW, BULLPUP, SNAKEYE, SHRIKE, flares, bombs, 20 mm, etc.

8. "Bomb Cook-Off Time, Information on" by (b) (6), NAVORD, Code 932, dated 17 August 1967, Serial ORD 932A:JFB

Discusses reaction of bombs to shock and heat. Enclosures include bomb configurations, explosive data and bomb characteristics.

9. "Bomb Fuze Booklet" by (b) (6), U S Naval Ordnance Lab (WO) dated 11 February 1966, NOLX 43

Characteristics of various bomb fuzes, primarily those used in the Fleet, are outlined in brief form. Bombs that the fuzes are used in, their characteristics, auxiliary equipment attached, and a technical description is furnished with further references.

10. "Bombs, Bomb Fuzes, Pyrotechnics, Chemical Dispersion Eqpt Handling, etc., Procedural Manual for" by Depts of the Army, Navy, and Air Force dated August 1954, TM 9-1977-1, OP 2174, AFM 80-3

A manual to be used as a guide in testing bombs, bomb fuzes, etc. The manual provides uniform test methods.

11. "Clothing, Flight, Protection Afforded by Fire Resistant Polyamide (PP-1) Coveralls in Helicopter Crash Fire" by BUWEPS dated 18 November 1964, DDC AD 453262L 6503 29A

A report summarizing the evaluation of protection afforded by a new fire-resistant polyamide fabric in direct comparison with nonfire-resistant clothing during a helicopter crash.

12. "COMNAVAIRPAC Ordnance Field Team Report" by Commander (b) (6) dated 29 December 1965, COMNAVAIRPAC NOTE 008010 NAVAIRPAC 7232 (Classified Secret)

Problems with comments are presented with recommendations as viewed by an Ordnance Team who visited several WESTPAC CVA's. Items covered included bombs, fuzes, rockets/launchers, 20 mm, HERO, ordnance handling, etc.

13. "Development and Qualification of the Zuni Weapon System" by NOTS, China Lake dated April 1963, NAVWEPS Report 8076 (NOTS TP 3094)

Covers general and technical data on development, performance and experimental production of Zuni rockets, fuzes, LAU-10/A applications, etc.

14. "Emulsified Engine Fuel Combats Chopper Fires" by Kurt R. Stehling dated August 1967, article in Vertical World (Magazine)

A discussion of the inherent dangers from fuel fires in aircraft crashes, and the current research in progress (1) to provide a system for emulsifying jet fuel in milliseconds in the event of crash or fuel tank rupture, or (2) to develop an engine which will use an emulsified fuel.

15. "Design Principles and Practices for Controlling Hazards of Electromagnetic Radiation to Ordnance", NAVWEPS OD 30393 dated 15 June 1965

A guide for the design and construction of HERO preventative techniques to be applied to weapons systems and subsystems.

16. "Effectiveness of Thermal Insulating Compound (TTC 311-S) with Boar Weapons in Vulnerability-to-Fire Tests" (U) by (b) (6) NOTS, China Lake dated 24 January 1961, Document No. 30-5286, Test Report 301-18

(b) (3) (A) [redacted]

(b)
(3)
(A) [redacted]

17. Explosive Loading of Naval Weapons by NOL, White Oak, NOL letter 66-183 dated 4 November 1966

A listing of explosives currently used and the amounts of these explosives in Naval weapons.

18. "Explosives Accidents/Incidents Statistical Report" by NWL Dahlgren dated 30 June 1967

A report of accidents during period 1 April to 30 June 1967.

19. "MK 82 Snakeye I Weapon (Bomb Body) Mark 82 Mod, with Bomb Fire Assembly Mark 15 Mod 0, Description, Operation, and Handling" by NOWEPS dated 15 January 1965

A preliminary pamphlet for introducing the weapon (MK 82 Snakeye I) to the Fleet and for OPNAV. Includes weapon handling and assembly including fuzing and installation to the aircraft.

20. "Survey of Explosives Safety Aspects of Conventional Ordnance Handling, Storage, Issue, and Preparation for Firing Aboard Various Ships and at Representative Shore Facilitie (U) by Rear Admiral F. J. Beeton, USN and Brigadier Genera W. G. Thrash, USMC, dated 24 May - 20 June 1965, CNO Secret letter OP-008 Serial 002P008 of 23 June 1965 with 2 enclosures

The report of a survey of Navy explosive safety involving conventional ordnance, conducted at the direction of the Secretary of the Navy. Inspections were conducted under surprise or no notice conditions by the authors of the report and by Mr. Howard Merrill, Special Assistant to the Secretary of the Navy. The important conclusions of the board were: (1) flagrantly hazardous conditions or operations are not being permitted in the Navy; (2) there are serious shortages of personnel and equipment in SE Asia; (3) USN and USMC are trying to maintain a wartime tempo of operations with peacetime manning level

21. "Technical Manual, Radio Frequency Hazards to Ordnance, Personnel and Fuel" by NAVWEPS dated 15 April 1966, NAVWEPS 16-1-529, 2nd Rev

Discusses operating procedures and precautions to prevent spurious initiation of electro-explosive devices (EED's). Includes considerable technical data on weapon/fuze combinations and several frequency/power-density curves for various ordnance.

22. "Temporary Handbook, Loading and Unloading Instructions, Guided Missile Model AAM-N-6 Sparrow III" by BUAER dated 1 May 1957, NAVAER 01-265 GMA A-509

Manual for handling Sparrow III. Includes brief description of the weapon and handling instructions relative to recovery, strikedown, ready stowage, delivery to the aircraft, etc.

23. "The Handling and Storage of Liquid Propellants", NAVWEPS OP 3179, Vol 1 dated 1 June 1965

Provides regulations for the safe handling, transportation and storage of liquid propellants.

24. "The Thermal Behaviour of Explosives Subjected to Simulated Aerodynamic Heating" (I, II:DATB, III; three reports) by (b) (6) [redacted] dated 15 October 1959 for NAVORD Rept 6216 (I), 28 February 1962 for NAVWEPS Rept 7338 (II:DATB), 25 July 1961 for NAVWEPS Rept 7363 (III)

Ignition time and heat flow were measured for various explosive materials including the temperatures at which these materials deflagrated.

25. "Warhead and Propulsion Unit Cook-Off and Drop Test Summaries (Missiles)" by NWL Dahlgren, enclosure (1) to NWL Dahlgren WXV:JFH:chj 8800/s, Serial 08155

Summary of test results on TALOS, TARTAR, TERRIER, XRD2-B, BULLPUP A, BULLPUP B, SIDEWINDER 1A, SIDEWINDER 1C, SHRIKE, SPARROW III-6A, SPARROW III-6B.

26. "Warhead Projectile Impact Test Summary" by NWL Dahlgren dated 18 September 1964, Serial 09119

Background information giving data on 3-9S, AQM-37A, BULLPUP A, BULLPUP B, SIDEWINDER 1A, SIDEWINDER 1B, SHRIKE, SPARROW III-6A, SPARROW III-6B, WALLEYE.

27. "Zuni 5.0 Inch General Purpose Folding-Fin Aircraft Rocket" by NOTS, China Lake dated 14 October 1958, NOTS 1478 Rev 1

A small brochure describing the weapon and its applications.

AIRCRAFT SYSTEMS

28. "Aircraft Fire, Prevention of by Use of Foams in Aircraft Fuel Systems" by BUMINES dated March 1967, Technical Report AFAPL-TR-67-36, DDC AD 380877

Experimental data are presented from small-scale and full-scale experiments on the flame arrestor effectiveness of a polyurethane foam material. Tests were conducted which verified the effectiveness of the material for use in a full-packed aircraft fuel tank configuration at atmospheric pressure conditions.

29. "Carrier On-Board Delivery (COD) Aircraft, Present Status and Five Year Plan", OPNAV OP 506 dated 22 August 1967

Compares the performance and capacity of the C1A and C2A.

30. "Fire and Explosion Assessment and Prevention Techniques for Aircraft" by [redacted] dated 30 June 1966, DDC AD 486902 66-18 ½A

Research is presented to assess the fire and explosion hazards associated with the use of aircraft fuels and lubricants under various environmental conditions.

31. "Fires and Explosion Hazard Assessment and Prevention Techniques for Aircraft" by BUMINES dated 31 March 1966, Task 304801, DDC AD 482033 66-12 ½A

Summarizes research performed during the period January 1 to March 31, 1966 to measure autoignition temperatures of lubricants at high pressures and autoignition temperature and flammability characteristics of aircraft fuels; also, discusses oxidation rate experiments.

32. "Fires in Aircraft, Suppression of, by Use of Lightweight Foam Plastics" by U S Army Aviation Material Laboratories, Fort Eustis, Va., dated March 1967, DDC AD 380958, Technical Rept 67-5

A detailed description of the research effort conducted to determine the most suitable low-density foam for use in preventing aircraft fuel fires resulting from ballistic impacts. Laboratory experiments indicated that fuel fires may be prevented or alleviated through application of low-density plastic foam to the outer walls of fuel cells and fuel system components.

33. "Fire, Protection of Aircraft by Use of Intumescent Paint Coating on Fire Walls", NADC dated 5 February 1965 DDC AD 456886L

A discussion of the effectiveness of an intumescent paint (Flamebar) submitted by Ocean Chemicals, Inc. when used to protect fire walls of aircraft.

34. "Fuel, Aviation Safety, Review of" by Coordinating Research Council, New York dated June 1964, DDC AD 612760 65-910 W65-910

Review of the technical information available concerning the safe handling and usage of aviation gasolines, Jet A (Kerosene), and Jet B (JP-4), which are currently used as commercial aviation fuels.

35. Naval Aircraft Fuel Vapor Sources by NAVAIRSYSCOM, AIR, 53632F, by (b) (6) [redacted] dated 21 August 1967

Compilation of drawings including the distance and relative position of refueling points to engine intakes.

36. "Navy Stockpile of Bomb Fuzes", Recommended Functional Classification of, AIR-53233-D:IAW Serial 07246 dated 2 October 1967

A tabulation by NAVAIR of the classification of the existing Navy stockpile of bomb fuzes based on the coordinated review of CINCLANTFLT and CINCPACFLT reclassifications.

37. "Shipboard Aircraft Fueling and Ordnance Mishaps" by Naval Aviation Safety Center, dated 31 August 1967

A listing prepared by the Naval Aviation Safety Center of mishaps to aircraft involving aircraft ordnance and refueling operations. Of interest is the relatively low number of shipboard refueling mishaps (21) with only two fires, and no aircraft losses. Also only two shipboard mishaps are recorded due to hot refueling, both aboard same CVA on two successive days, with no damage.

38. "Vertical Replenishment Helicopter Program, Present Status and Five Year Plan" by NAVAIRSYSCOM, AIR 51043, Major (b) (6) [redacted] dated 22 August 1967

Paper describes the capabilities and characteristics of the UH-46. Performance charts and photographs are included.

PERSONNEL, ORGANIZATION AND OPERATIONS

39. "Battle Control" (U) NWIP 50-1 (B), CNO publication dated 19 November 1965

Authoritative background material on Fleet damage control policy. Describes organization and procedures. Defines responsibilities of various ship officers.

40. "Captain J. H. Iannabino's Appeal of Letter of Reprimand" by Captain John H. Iannabino, C. O.

Contains documentation and testimony which tend to illustrate the problem areas encountered by attack carriers as a result of the high tempo of combat operations and the short turnarounds. Discusses deficiencies of the MK 24 flare.

41. "CVA Rotation" by OP-332 dated 17 October 1966 (classified Secret)

Summarizes the CVA development situation, including tempo of ops, schedules, etc.

42. "Human Engineering Guide to Equipment Design" by C. T. Morgan, et al, (editor) dated 1963

A basic handbook of human engineering methodology

and design requirements was prepared by the joint services steering committee. Data on human sensory and motor performance, anthropometery crew station design parameters, and basic human design parameters is presented.

43. "NAVORDSYSCOM's Safety Organization and Procedures" by Commander, Naval Ordnance Systems Command dated 16 August 1967, ORD-932A-JFB

A discussion of NAVORD's safety program.

44. "Reflective and Non-Reflective Materials for Use in Proximity Fire Fighters' Clothing, A Comparison of" by U S Naval Supply Research and Development Facility, Bayonne, N. J., dated May 1966, DDC AD 486921

Preliminary study of the heat protective characteristics of an experimental non-reflective layered assembly as compared with the standard aluminized assembly currently used in proximity fire fighters' clothing.

45. "The Utilization of Human Factors Information by Designers" (U) by David Meistey and Donald Farr dated 16 September 1966, Bunker Ramo Corp.

An investigation was conducted to determine how designers solve human factor problems in the overall design process. Design problems were devised to establish: (1) the kinds of information and criteria the designer uses in design decisions, (2) the extent to which handbooks are used, (3) the analysis employed during typical design tasks.

SHIP SYSTEMS

46. "Battle Damage to Surface Ships During WW II" by I. M. Korotkin dated 1960, Translation 310, S-F013 04 03, Task 1759, February 1964 for David Taylor Model Basin

This is a translation of a Russian document presenting data on battle damage to surface ships (less USSR) in WW II. The data contained in the publication are related to the subject of fires in carriers.

47. "Booklet of General Plans Aircraft Carrier CVA 59" By NAVSHIPS, Revised 13 July 1967

Booklet is marked up to show damage experienced by FORRESTAL. Photographs of the damage are included.

48. Carrier Hazards by Rear Admiral Gayler dated 7 August 1967, letter OP 07B1FK Serial 027P07

Contains comments concerning potential areas of investigation to improve safety of aircraft carriers.

49. "Chapter 88 Damage Control Sections I & II" by NAVSHIPS, NAVSHIPS 250-000-88

Summary of stability and buoyancy criteria used in naval ship design and practical damage control procedures.

50. "Chapter 93 Fire Fighting Ship", NAVSHIPS 0901-993-000 (Chapter 93) dated 1 November 1965

Guide to current shipboard fire fighting systems.

51. "Clothing Fire Fighter's Development of Improved Aluminize Fabrics for" by (b) (6) [redacted] and (b) (6) [redacted] dated July 1965, DDC AD 472069L 65-2311.5A

The report deals with the development of a 1.2 lb abrasion-resistant aluminized, asbestos, herringbone twill fabric for use in fire fighters' clothing. Improvement over the standard aluminized glass/ asbestos fabric and the retention of heat reflectivit after simulated wear. Data from laboratory evaluatio and field trials are included. The new material will be used as the shell of the newly-designed alumi- nized fire fighters' clothing at Naval Air Stations.

52. "CVA 64 Ship Information Book", Vol 2, Parts 1 and 2, by New York Naval Shipyard dated August 1962

Document covering piping details of existing CVA systems.

53. "Fire and Explosion, Detection by Use of Ultraviolet, Fiber Optics" by D. A. Pontarelli, et al of IIT Research Center, DDC AD 809848 13/12A

The results of this program have extended long fiber optics bundle short wavelength transmission and now make it possible to remotely detect flames using ultraviolet sensors.

54. "Fire Fighting System, Employing Purple-K and a Compatible Foam" by Applied Science Laboratory, Lab Project 9300-60, DDC AD 489060 L66-21 13/12A dated 31 August 1966

Discusses the extremely rapid extinction characteristics of Purple-K with the vapor securing properties of a newly-developed dry powder-compatible fluorinated protein foam.

55. "Fire, Extinguishing Agents for Shipboard Machinery Spaces - A Comparative Study of" by NRL dated 15 April 1966, DDC AD 633687 66-1413/12

Fire tests employing a 735^2 bilge area covered with No. 2 diesel fuel within a simulated shipboard engine room structure were conducted. These tests were designed primarily to compare the effectiveness of the new "Light Water-Purple-K-Powder" system and the Type 5 protein foam presently used aboard ship. Other agents, such as "XL-6" protein foam, and carbon dioxide were tested.

56. "Gas Turbine Powered Vehicle for Firefighting" by (b) (6) (b) (6) et al, NRL dated 22 September 1965, DDC AD 623290 65-24 ½

A turbine powered vehicle was compared to a conventional engine model truck now in operation, both for rapidity of acceleration and for ease of operation.

57. "General Specifications for Ships of the United States' Navy" by NAVSHIPS, updated to 3 July 1967

Reference document for shipboard system design requirements.

58. "Handbook of Ship Design Considerations and Criteria for Protection from Weapons Effects", NAVSHIPS, dated 1 October 1959, NAVSHIPS 250-423-9

Describes design criteria for ship protection including ballistic, air blast, fire fighting, etc.

59. "Informal Board of Investigation of Inquiry into the Circumstances Surrounding the Fire Which Occurred in Compartment C-530-2A on Board USS FRANKLIN D ROOSEVELT (CVA 42)" by Captain A. B. Grimes dated 13 November 1966

Fire on FDR was caused by improper handling and stowage of calcium hypochlorite (laundry bleach). Report points up the inherent dangers in using some materials aboard ship.

60. "INSCENLANTFLT 14-67" Damage Control Readiness in COMNAVAIRLANT Ships; report of, dated 29 June 1967

Report of an examination of the state of DC readiness in LANTFLT carriers conducted in June 1967.

61. "Light Water - Discussion of" by Minnesota Mining and Manufacturing Co., 1/ILEA (67.5)LP (3M Corp PA or PVLLEE)

Discusses characteristics of fluorinated fresh water used for fighting fires.

62. "Naval Ship Systems Command Technical Action on Survey of Explosives Pyrotechnics, and Flammables in Pacific Fleet Carriers", NAVSEC Serial 6122-039 dated 14 June 1967

Summarizes NAVSHIPS action on all recommendations by Mills Survey.

63. "Paint, Intumescent Evaluation of as a Fire Retardant Covering" by J. J. Veliky dated October 1965, DDC AD 472578 65-23 11/3A

A study of intomescent paints to determine available types, methods of application and cure, necessary safety precautions, and thermal insulating properties.

64. Photographs of CVA 59 Fire, taken 30 and 31 July 1967

Photos show extent of fire and bomb damage.

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65. Photographs of Typical Deck Spots on CVA 34 and CVA 59 by NAEL dated 17 August 1967.

Photographs showing spotting studies made with Air Wings aboard ships at time of disasters.

66. "Recommendations of a Board of Investigation Convened by COMNAVAIRPAC to Investigate the Fire in USS ORISKANY (CVA 34) on 26 October 1966" by Admiral A. M. Shinn, Serials 866, 833, 870, 767, 765, 768

Copies of letters from COMNAVAIRPAC to ORISKANY, CNATRS, NAVAIR, TRAPAC, FITAIRWAW, BUPERS, NAVSHIPS, recommending specifications of ORISKANY investigation. Letter to NAVAPR, BUPERS, CNATRA citing need for increased training of officer and enlisted personnel in weapons handling.

67. "Record of Proceeding of a Formal Board of Investigation to Inquire into the Circumstances Surrounding a Fire Which Occurred on Board USS ORISKANY (CVA 34) on 26 October 1966" by V. P. DePoix, Serial 03581

Report discusses design deficiencies in flares, ventilation system, conflag station, OBA, P-500.

68. "Replenishment at Sea" by NAVSEC, Code 6698R, dated July 1966

This document summarizes the replenishment program and includes the shipbuilding program, capabilities of ships, developmental objectives and schedules.

69. "Report of an Informal Board of Investigation Inquiring into the Circumstances Surrounding a fire which Occurred on Board the USS FORRESTAL (CVA 59) on 29 July 1967" dated 19 September 1967

Includes a detailed discussion of the background, sequence of events and condition of readiness of the FORRESTAL and actions taken during the fire. Detailed descriptions of ordnance and discussion of lessons learned are also included.

70. "Specifications for Building Aircraft Carrier, Attack (Nuclear) CVAN 68" by NAVSHIPS dated 9 November 1966, NS 0902-011-7010

Documents describing design requirements for latest attack carrier.

71. "Survey of Carrier Accidents from 1951 - 1967" by Dr., (b) (6) NSRDC dated 26 September 1967

Contains discussion of incidents which resulted in fire and damage with the view of determining what lessons could be learned. Included are ESSEX (16 September 1951), ORISKANY (6 March 1953), CONSTELLATION (6 November 1961), WASP (18 August 1954), ESSEX (16 January 1958), ESSEX (28 May 1959) BOXER (6 August 1952).

72. "Total Fire Extinguishing Systems" by Total Export GMBH of Manheim, Germany dated 24 August 1967

Description of dry powder fire extinguishing system manufactured in Germany. System in use in merchant ships, German Navy ships and in an underground hangar in Norway.

73. "Toxicity and Fire Hazards Associated with Shipboard Materials" by Naval Research Laboratory dated 13 September 1967

Document deals with potential material hazards aboard ships and recommends programs to identify and eliminate. Discusses the MK 5 gas mask.

74. Trip Report Covering USS FORRESTAL Damage by Commander (b) (6), USN, dated 15 August 1967, Serial 6122-074

Report of survey of FORRESTAL damage.

75. "USS AMERICA (CVA 66) Ship Information Book", Vol I by Newport News Shipbuilding and Drydock Company dated April 1964, NAVSHIPS 0905-003-7010

Description of existing CVA systems (hull and mechanical).

76. "USS FRANKLIN (CV 13)" by BUSHIPS dated 15 September 1946, War Damage Report No. 56

Report covers Suicide Panel Crash on 30 October 1944 and bomb damage occurring on 19 March 1945. Similarities exist between 19 March damage and FORRESTAL accident.

77. "USS HORNET (CV 8) Loss in Action, 26 October 1942" by BUSHIPS dated 8 July 1943, War Damage Report No. 30

Discussion of damage to ship emphasizing contribution of mattresses, clothing, upholstered furniture, etc. to the tenacity of the fire.

78. "USS LEXINGTON (CV 2) Loss in Action" by BUSHIPS dated 15 June 1942, War Damage Report No. 16

A discussion of a fire caused by gasoline vapor. Inability of escorting destroyers to assist in fighting the fire is described.

79. "USS LISCOME BAY (CVE 56) Loss in Action on 24 November 1943" by CNO/BUSHIPS dated 19 March 1944, War Damage Report No. 45

A description of the effects of a torpedo hit in an aviation bomb stowage compartment.

80. "USS PRINCETON (CVL 23) Loss in Action on 24 October 1944" by BUSHIPS dated 30 October 1947, War Damage Report No. 62

A discussion of a hangar deck conflagration.

81. "USS YORKTOWN (CV 5) Loss in Action on 7 June 1942" by CNO/BUSHIPS dated 9 March 1943, War Damage Report No. 25

A description of inadequate torpedo protection and the need for sectionalization of engineering spaces for subsequent carriers.

ANNEX C - BRIEFINGS

The briefings presented to the full session of the panel are listed in chronological order in this Annex, with a brief summary of the content.

The full text, or in some cases the outline, of each presentation listed in this Annex, has been retained in the panel files.

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1. FORRESTAL Fire. PLAT tape from USS FORRESTAL, 15 Aug 1967.

Movie made from PLAT tape taken by island panoramic camera and from film taken by hand held camera of fire and explosions aboard USS FORRESTAL on 29 July 1967.

2. Current Attack Carrier Operations in Southeast Asia. CAPT J. L. HOLLOWAY, III, USN (OPNAV Former CO, USS ENTERPRISE, CVAN-65) 16 Aug 1967.

Description of attack carrier operations in Task Force-77, including strike operations, replenishment, ammunition handling, employment plans, and flight schedules.

3. Ordnance Handling Aboard West Pac CVA's. Mr. (b) (6) GS-14, (Fuze design engineer, NOL White Oak) 16 Aug 1967.

Report of a field trip to TF-77 to examine ammunition handling procedures with a series of photographs illustrating congested conditions aboard ship and a number of unsafe handling practices.

4. New Fire Fighting Techniques. Dr. (b) (6) (Naval Research Laboratory) 17 Aug 1967 at NRL.

Demonstration and field briefing of twinned agent fire truck using light water and Purple K powder to extinguish jet fuel and gasoline fires.

5. USS Forrestal Damage. CDR (b) (6) USN (Naval Architect, U. S. Naval Ships Engineering Center) 17 Aug 1967.

Description with plans, charts, and overlays, of the material damage done aboard the USS FORRESTAL as a result of the 29 July 1967 fire. CDR (b) (6) was head of the NAVSHIPSYSCOM damage evaluation team.

6. Improved Rewinding Rate Program. CAPT K. L. NELSON, USN, (AIR 507, NAVSHIPSYSCOM) 17 Aug 1967.

Description of Improved Rewinding Rate Program (IRRP) by Director, Ships Installation Division, including technical description of material features, funding considerations, and installation schedule.

7. USS ORISKANY Fire. CAPT J. H. TAMBARINO, USN (Former CO, of ORISKANY) 18 Aug 1967.

Description of the fire aboard USS ORISKANY, including the preceding events, an account of fire fighting actions, and an analysis of cause, damage and casualties. Extensive charts and photographs.

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8. Naval Air Force Pacific Fleet, Personnel Assignment. CAPT T. D. HASTINGS, II, USN (Force Personnel Officer) 6 Sept 1967 at COMNAVAIRPAC Headquarters.

Discussion of assignment of officers to CVA Engineering and Weapons departments, availability of supervisory petty officers, increased ship population, and TAF fund situation.

9. Naval Air Force Pacific Fleet, Personnel Technical Training. CDR (b) (6) USN (Force Weapons Technical Training Officer) 6 Sept 1967 at COMNAVAIRPAC Headquarters.

Discussion of ordnance "A", "B" and "C" schools, establishment of additional NAMTRADETF, availability of inert, live and practice ordnance and organizational changed in CVA weapons departments.

10. Naval Air Force Pacific Fleet Damage Control Training and Readiness. CDR (b) (6) USN (Force Ship's Training Officer) 6 Sept 1967 at COMNAVAIRPAC Headquarters.

Discussion of damage control and fire fighting schools, training provided ships at sea, Operational Readiness Inspections underway refresher training, damage control equipment availability ship design deficiencies, Air Wing damage control training and personnel stability in repair parties.

11. Naval Air Force Pacific Fleet, Operating Schedules. LCDR (b) (6) USN (Force Scheduling Officer) 6 Sept 1967 at COMNAVAIRPAC Headquarters.

Discussion of CVA employment thru FY72 regarding effects of overhaul, restricted availability, work-up time, pilot exposure, carrier qualification deck availability, shipyard load, Air Wing weapon deployments and supply and support.

12. Naval Air Force Pacific Fleet, Tempo of Operations. CAPT J. L. SNYDER, USN (Force Training Officer) 6 Sept 1967 at COMNAVAIRPAC Headquarters.

Discussion of casualty reports, equipment usage, aircraft usage, personnel fatigue, underway replenishment, available drill time and safety as it relates to increased tempo of operations.

13. Naval Air Force Pacific Fleet, Weapons Compatability, Ships and Aircraft. CDR (b) (6) USN (Force Weapons Technical Material Officer) 6 Sept 1967 at COMNAVAIRPAC Headquarters.

Discussion of weapons technical publication, ships weapon stowage, handling equipment, ordnance elevators, standardization of aircraft weapons systems, users feedback requirement and ready service facilities.

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14. Air Launched Weapons Fallbrook Annex. CAPT E. G. SIMMON, USN (Commanding Officer, USNWS Seal Beach, Calif.) 7 Sept 1967 at Fallbrook Annex.

Tour of Fallbrook Annex and a briefing on the Annex's mission to receive, renovate, test, assemble, store and issue Navy conventional air launched missiles.

15. Training Command Pacific Fleet. RADM David LUBBEN, USN (Commander Training Command Pacific) 7 Sept 1967 at COMTRAPAC Headquarters.

a. Fleet Training Group. Discussion of limited training time, shipyard slippage, ship material condition, training exercise requirements, ship self training programs and Air Wing participation.

b. Fleet Training Center. Discussion of fire fighting and damage control syllabi, facilities, instructors and school quota utilization.

16. Naval Weapons Center, China Lake. CAPT G. H. JONES, USN (Commanding Officer) Mr. [redacted] (Technical Director) 8 and 9 Sept 1967 at NWC China Lake, Calif.

Description of the organization and mission of NWC China Lake.

17. NWC China Lake. The Establishment of the Technical Development Process (Concept and the Design Criterion. Mr. [redacted] (Head, Weapons Development Department, NWC) 8 Sept 1967 at NWC China Lake.

Discussion of design analysis and safety considerations, quality assurance in production, project team structure, test requirements, weapon acquisition cycle, safety objectives and design dilemmas of a weapon system.

18. NWC China Lake. The Development and Test of the Warhead. Mr. [redacted] (Propulsion Development Department, NWC) 8 Sept 1967 at NWC China Lake.

Discussion of safety design criteria, engineering phase, quality assurance techniques and loading process development of guided missile warheads.

19. NWC China Lake. The Development and Test of the Fuze and the Safe and Arm Device. Mr. [redacted] (NWC Corona Laboratory) 8 September 1967 at NWC China Lake.

Discussion of BUORD letter of 1953 establishing policy concerning safety and arming of fuzes, Military-Standard

No. 1316 "Fuzes, Navy, Design Safety Criteria for" dated June 1967, description of safety -- arming device, procurement specifications, RADHAZ susceptibility, tests and safety improvement.

20. NWC China Lake. The Development and Test of the Rocket Motor. Mr. (b) (6) (Propulsion Development Department, NWC) 8 Sept 1967 at NWC China Lake.

Discussion of tactical systems development, propulsion system synthesis, environmental forcing functions, stockpile-to-target sequence, qualification tests, trade off, hardware development, diagnostic tests, design test, qualification tests, compatibility tests, type-life tests and safety related tests of rocket motors.

21. NWC China Lake. The Development and Test of the Weapon System and the Related Aircraft Installation. Mr. (b) (6) and Mr. (b) (6) (Weapons Development Department, NWC) 8 September at NWC China Lake.

Description of development tests conducted using Rockeye II as a typical conventional weapon and safety factors encountered with the introduction of multiple bomb racks.

22. NWC China Lake. The Technical Evaluation, Ship Suitability Tests and Logistic Cycle. Major (b) (6) USMC and Mr. (b) (6) (Naval Missile Center, Pt. Mugu) 8 Sept 1967 at NWC China Lake.

a. Description of the mission of Naval Missile Center to test a weapon or aircraft system and evaluate its conformance with design specifications and suitability for service use. The two principle types of tests are the Navy technical evaluation and board of inspection and survey.

b. Discussion of ship/weapon suitability tests including yard walk thru, consolidated operability check, predeployment review, at sea reviews and future consideration.

23. NWC China Lake. The Operational Evaluation of a Weapon System. CDR (b) (6) USN (Air Development Squadron 5) 8 Sept 1967 at NWC China Lake.

Description of the mission of VX-5 to conduct tests, evaluations and investigations, in an operational environment, of aircraft weapons systems, support systems, equipment and material and develop tactics and doctrine for their use.

24. NWC China Lake. Checklists, Loading Manuals and Technical Documentation. CDR (b) (6) USN (Naval Weapons Evaluation Facility, Kirtland AFB, Albuquerque, N.M.) 8 Sept 1967 at NWC China Lake.

a. Discussion of NWEF mission to produce conventional weapon checklists and to verify loading manuals.

b. Discussion of Naval Air Technical Services Facility, Philadelphia, Pa. mission to issue technical documentation on new weapons and aircraft.

25. NWC China Lake, Fleet Introduction. CDR [redacted], USN (Air Weapons Officer, NWC) 8 Sept 1967 at NWC China Lake.

Discussion of the complex requirements to successfully introduce a new weapon into the fleet.

26. NWC China Lake, Quality Assurance in Production, Logistics and Rework of Weapons. Mr. [redacted] (Engineering Department, NWC) 8 Sept 1967 at NWC China Lake.

Discussion of production and rework quality assurance responsibilities and procedures.

27. Advanced Carrier Concepts. Mr. [redacted] (AIR-3034 NAVAIRSYSCOM) 12 Sept 1967.

Description of possible advanced carrier concepts.

28. Damage Control -- Ready or Not. CDR [redacted], USN (OP-3302, OpNAV) 13 Sept 1967.

Discussion of Damage Control organization, administration and training by an ex-CVA-DCA and author of "Damage Control -- Ready or Not" (Naval Institute Proceedings, January 1967).

29. Functions and Responsibilities of NAVAIRSYSCOM Armament Division. CDR J. (H) PATTERSON, JR., USN (AIR 532 NAVAIRSYSCOM) 13 Sept 1967.

Discussion of the functions, responsibilities and procedures for administering the NAVAIRSYSCOM portion of air launched weapons programs.

30. Standard ARM Project. CAPT E. B. BOUWELL, USN (PMA 42 NAVAIRSYSCOM) 13 Sept 1967.

Discussion of Standard ARM Project and the status of safety tests conducted to date.

31. Naval Air Force Atlantic Fleet, Operating Schedules -- High Tempo of Operations. CAPT J. E. [redacted], USN (COMFAIRMEDAY Operations Officer) 18 Sept 1967 at COMFAIRMEDAY Headquarters.

Discussion of aircraft, ship personnel, training, readiness and force level factors as related to scheduling and tempo of operations.

32. Naval Air Force Atlantic Fleet. Personnel Assignment. CAPT R. E. LARSON, USN (CNAL-10 NAVAIRLANT Personnel Officer) 18 Sept 1967 at COMNAVAIRLANT Headquarters.

Discussion of assignment of officer to CVA Engineering and Weapons departments, availability of enlisted personnel and a newly established training liaison section in NAVAIRLANT Personnel Office.

33. Naval Air Force Atlantic Fleet. Training and Readiness. CAPT R. E. LARSON, USN (CNAL-33 NAVAIRLANT Training Officer) 18 Sept 1967 at COMNAVAIRLANT Headquarters.

Discussion of damage control, fire fighting and ordnance schools, Operational Readiness Inspections, underway refresher training, training ordnance allocation, personnel turn-over, school locations and ship force requirements during overhaul and restricted availability.

34. Naval Air Force Atlantic Fleet. Ship Weapon Compatability. CAPT R. E. LARSON, USN (CNAL-33 NAVAIRLANT Training Officer) 18 Sept 1967 at COMNAVAIRLANT Headquarters.

Discussion of weapon stowage, bomb elevators, handling equipment, strike down/up rate, assembly areas and introduction of new weapons.

35. Naval Air Force Atlantic Fleet. Ideas for Enhancing Safety. CAPT R. E. LARSON, USN (CNAL-33 NAVAIRLANT Training Officer) 18 Sept 1967 at COMNAVAIRLANT Headquarters.

Discussion of ideas to enhance safety in CVA operations.

36. Naval Air Force Atlantic Fleet. Effect of High Tempo Operation on Ship Material. CDR [redacted] USN (CNAL-514 NAVAIRLANT Ship Maintenance Management Officer) 18 Sept 1967 at COMNAVAIRLANT Headquarters.

Discussion of ship material condition as related to age, underway time, overhaul/restricted availability interval and funding, and turn-around time.

37. Naval Air Force Atlantic Fleet. Engineering Operational Maintenance System (EOMS). CDR [redacted] USN (CNAL-51A NAVAIRLANT Assistant Ship Material Officer) 18 Sept 1967 at COMNAVAIRLANT Headquarters.

Discussion of Engineering Operational Management System which provides for coordinated, standardized, written procedures to manage and operate the engineering plant.

38. Service Force Atlantic Fleet. CAPT C. J. DEERS, USN (Chief of Staff, COMSERVLANT) Sept 1967 at SERVLANT Headquarters.

Discussion of personnel, training, damage control and safety aboard AE's particularly relating to CVA underway replenishment.

39. Training Command Atlantic Fleet. RADM J. S. CAYEN Jr., USN (COMTRALANT) 19 Sept 1967 at COMTRALANT Headquarters.

a. Fleet Training Centers. Discussion of capacity and utilization of fire fighting and damage control schools.

b. Fleet Training Group. Discussion of mission, decreased training time, damage control deficiencies and a comparative evaluation of various carriers in damage control.

40. Jellied Fuels/Improved Fire Pumper. Mr. (b) (6) (Marine Engineer at U. S. Naval Ship R & D Center) 20 Sept 1967.

Brief on (1) current status of R & D on jellied fuel and (2) description of the capability of an improved fire pumper unit.

41. CNM Dangerous Materials Study Group. Mr. (b) (6) (SEC CNO NAVSEC) 20 Sept 1967.

Description of effort by CNM to identify characteristics of all dangerous materials used aboard ship and to ensure that they are properly marked, handled and stowed.

42. Naval Weapons Laboratory, Dahlgren. General Remarks and Introduction. CAPT W. A. HASLAM, Jr., USN (NWL Commanding Officer) and LCDR (b) (6), USN (NWL Staff).

Description of NWL charter, funding, organization, weapon safety program and supporting research.

43. Naval Weapons Laboratory, Dahlgren. Engineering Aspects of Safety. Mr. (b) (6) (Chief Engineer, Missile Safety Unit) 21 Sept 1967 at NWL Dahlgren.

Discussion of system management, timely identification and initiation of action necessary to prevent or control hazards.

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44. Naval Weapons Laboratory, Dahlgren. Safety Program Tests. Mr. [redacted] (NWL Staff) 21 Sept 1967 at NWL Dahlgren.

Discussion of safety program tests including firing tests, accident simulations, transportation and enviromental conditions.

45. Naval Weapons Laboratory, Dahlgren. Safety Considerations for Air Launched Ordnance. Mr. [redacted] (NWL Staff) 21 Sept 1967 at NWL Dahlgren.

Discussion of status of aircraft carrier ordnance safety programs as related to safety design requirements, analysis, testing, documentation and release.

46. Naval Weapons Laboratory, Dahlgren. General HERO Consideratio: Mr. [redacted] (NWL Staff) 21 Sept 1967 at NWL Dahlgren.

Discussion of weapons HERO criteria, hazards when HERO restrictions are ignored, HERO survey of ships, shipboard HERO responsibility, HERO program funding and HERO training for the fleet.

47. Naval Weapons Laboratory, Dahlgren. HERO Status of Specific Weapons. Mr. [redacted] (NWL Staff) 21 Sept 1967 at NWL Dahlgren.

Discussion of HERO status of specific weapons now in the fleet and current efforts to fix susceptible weapons.

48. Personnel, Officer Distribution. CAPT H. T. FITZ, USN (PERS B4101, Head Fleet Staffs and Carrier Placement) 22 Sept. 1967.

Discussion of general manning levels, resources, carrier manning, performance criteria, functional training and manning policies.

49. Personnel, Enlisted Distribution. CAPT R. S. GUY, USN (PERS B4b, Head, Implementation Management System) 22 Sept 1967.

Discussion of general manning, reenlistment, rating control and BuPers controlled training.

50. OPNAV Aviation Training. Mr. [redacted] (OP-562D, Assistant Technical Training) 22 Sept 1967.

Discussion of OP-56 mission to establish policy, requirements, operating direction and performance standards and to appraise program effectiveness in aviation training.

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51. CVA Ordnance Handling. CDR (b) (6), USN (Naval Air Test Center/Weapons Systems Test, NAS Patuxent River) 22 Sept 1967

Outline of a report by NATC regarding conventional ordnance handling aboard NESTRAC CVA's. Supporting color slides are held by NATC/WST Patuxent River, Maryland.

52. Naval Ordnance Laboratory White Oak. Captain C. F. SCHNEIDER, USN (Commanding Officer) and Dr. (b) (6) (Technical Director) 25 Sept 1967 at NOL White Oak, Md.

Description of the laboratory's mission and brief historical resume.

53. Naval Ordnance Laboratory White Oak. Explosive Cook-Off Tests. Dr. (b) (6) (Associate Head, Chemistry and Explosives Research NOL White Oak) 25 Sept 1967 at NOL White Oak, Maryland.

Discussion of NOL recommendations to decrease hazards in aircraft carriers and a report on weapons cook-off tests.

54. Naval Ordnance Laboratory White Oak. General Principles for Design Safety. Mr. (b) (6) (General Engineer - Operations Division Air and Surface Evaluation Department, NOL White Oak.) 25 Sep 1967 at NOL White Oak.

Discussion of safety philosophy and general principles of fuze design safety.

55. Naval Ordnance Laboratory White Oak. Management's Implementation of Safety Philosophy into NOL Developed Components and Weapons. Mr. (b) (6) (Associate Director and Head Underwater Weapons Development) 25 Sept 1967 at NOL White Oak.

Discussion of management techniques used to inject safety into all levels of design, development and evaluation of NOL developed weapons.

56. Naval Ordnance Laboratory White Oak. World War II Dogh Fuzes and the M 904E2 Fuze. Mr. (b) (6) (Chief, Mechanical Systems Materials Division, Air and Surface Mechanical Engineering Department, NOL White Oak) 25 Sept 1967 at NOL White Oak, Maryland.

Discussion of World War II fuzes as compared to the M 904E2 fuze of today.

57. Naval Ordnance Laboratory White Oak. Post World War II Bomb Fuzes. Mr. (b) (6) (Project Manager for Fuzes, Air and Surface Weapons Development NOL White Oak.) 25 Sept 1967 at NOL White Oak, Maryland.

Discussion of post World War II fuze development with emphasis on safety features.

58. Naval Ordnance Laboratory White Oak Electric Bomb Fuze System. Mr. (b) (6) (Assistant for Conventional Devices, NOL White Oak) 25 September 1967 at NOL White Oak, Maryland.

Discussion of development of the electric fuze to provide electrically initiated in-flight arming of air launched weapons.

59. Naval Ordnance Laboratory White Oak. Rocket Fuze Safety. Mr. (b) (6) (Chief, Mechanisms Division Air and Surface Evaluation Department NOL White Oak) 25 Sept 1967 at NOL White Oak, Maryland.

Discussion of the design and development of fuzes to meet requirements of rocket propelled weapons.

60. Naval Ordnance Laboratory White Oak. Destructor Mark 36. Mr. (b) (6) (Supervisory Electronics Engineer, Magnetics and Electrical Division, Underwater Electrical Engineering Department NOL White Oak) 25 Sept 1967 at NOL White Oak, Md.

Discussion of the development of the Destructor MK-36 and current efforts to improve safety and reliability.

61. Rescue Breathing and Escape Breathing Apparatus. Mr. (b) (6) (6130E - NAVSEC) 26 Sept 1967.

Description and display of current and developmental breathing and escape apparatus including the MK V gas mask.

62. Hills Committee Report and Follow-up Action. Captain Wm. Lawson, USN (NAVAIR 522) 25 September 1967.

Brief on findings of the Hills Committee which surveyed explosives, pyrotechnics and flammables on ASW carriers and the follow-up actions taken by NAVSHIPSYSCOM.

63. Flight Deck Conflagration Control. LCDR (b) (6) USN (NAVAIR 6100D) 26 Sept 1967.

Discussion of CNM programs relating to Purple K Powder/Light Water, flight deck conflagration control and countermeasures wash down systems.

64. Damage Control Systems in CVA-67 and CVAN-68. LCDR [redacted], USN (NAVSEC 6110B) 27 Sept 1967.

Description of improved damage control systems incorporated in CVA-67 and CVAN-68.

65. Ordnance Loading and Handling Equipment. Mr. [redacted] (NAVAIR - 53441) 27 Sep 1967.

Brief summary of current and future ordnance loading and handling equipment.

66. Human Factors. CDR [redacted] USN (OP-701H Panel Member) 28 Sept 1967.

Discussion of human factors as they apply to CVA operations.

67. Carrier Refresher Training. LCDR [redacted], USN (FTG 6200 Panel Member) 28 Sept 1967.

Description of the function of Fleet Training Groups with emphasis on damage control and ship material condition.

68. Fuel Cell Safety Foam. Mr. H. C. Chandler (Firestone Tire and Rubber Co.) 28 Sept 1967.

Description of a recently developed reticulated poly urethane foam which can be installed in fuel cells to reduce fire hazard resulting from ruptured cells.

69. Emulsified Fuel and Damage Resistant Fuel Cells. Mr. [redacted] (Army Aviation Material Laboratory, Ft. Eustis, Va.) 28 Sept 1967.

Discussion of Army Aviation research and development relating to emulsified fuel and damage resistant fuel cells.

70. USAF Explosive Safety Policies. COL [redacted], USAF (Air Force Materiel Command) 28 Sept 1967.

Brief on Air Force philosophy and procedures relating to explosive safety.

71. Air Launched Weapons. CDR [redacted], USN (Weapons Systems Test Division, NATC) 29 Sept 1967 at NATC, Patuxent River.

A tour, with associated briefings, of a display of operational fleet aircraft loaded with the complete variety of modern operational air launched weapons; examples of improperly rigged and armed weapons, a display of supporting test equipment, and a film on air launched weapons separation characteristics.

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72. Genesis of Air Launched Conventional Weapons. LTCOL (b) (6) USMC (OP-722D3) 3 Oct 1967.

Description of the development of air launched conventional weapons from concept to fleet introduction.

73. Naval Explosive Safety. Mr. (b) (6) (OP-411H) Head, Explosives Safety Section 3 Oct 1967.

Discussion of the Naval Explosive Safety Program as it is administered in the Navy Department.

74. Damage Control Training Conference. RADM T. S. KING, USN OP-37 Head, Fleet Readiness and Training) 4 Oct 1967.

Report on the outcome of a conference called to identify damage control skills and training requirements.

75. Department of the Navy Safety Program Review Board. RADM D. F. DUDAS, USN (Op-00B3 Deputy Naval Inspector General) 5 Oct 1967.

Report on the findings and recommendations of the Department of the Navy Safety Program Review Board.

76. Army Explosives Safety. COL (b) (6) USA (Army Material Command) 6 Oct 1967.

Discussion of the philosophy and organization of Army explosive safety.

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ANNEX D -- INTERVIEWS

Persons interviewed by the Director, either alone or in company with a few Panel members are listed in this Annex. This list is supplemented by memoranda for the record which briefs the matters discussed.

Persons interviewed:

15 Aug 1967 - Washington, D. C. - Admiral Thomas H. Moorer, USN, Chief of Naval Operations
Admiral Horacio Rivero, Jr., USN, Vice Chief of Naval Operations

17 Aug 1967 - Washington, D. C. - RAdm Neal A. M. Gayler, USN, Asst Deputy CNO (Development)

17 Aug 1967 - Washington, D. C. - RAdm Henry L. Miller, USN, Chief of Information

18 Aug 1967 - Washington, D. C. - Captain John E. (Blackie) Kennedy, USN, Past C.O., USS INDEPENDENCE

18 Aug 1967 - Washington, D. C. - RAdm (Select) Martin D. Carmody, USN, Director, Command Control & Electronics Division (Past C.O., USS KITTY HAWK)

19 Aug 1967 - Washington, D. C. - Captain (Select) Shelly Pillman, USN, NAVAIRSYSCOM (Past Weapons Officer on KITTY HAWK)

19 Aug 1967 - Washington, D. C. - VAdm Thomas F. Connolly, USN, Deputy CNO (Air)
RAdm David C. Richardson, USN, Asst Dep CNO (Air)

19 Aug 1967 - Washington, D. C. - Admiral Thomas H. Moorer, USN, Chief of Naval Operations

21-22 Aug 1967 - Pearl Harbor - Admiral Roy L. Johnson, USN, CINCPACFLT

4 Sep 1967 - Subic Bay, P. I. - RAdm Fillmore B. Gilkerson, USN, Commander Naval Base, Subic Bay
Captain Zebulon V. (Zeb) Knott, USN, C.O., USS DIAMOND HEAD (AE-19)

5 Sep 1967 - Pearl Harbor - Captain Dan T. Drain, USN, Chief of Staff, COMSERVPAC
RAdm Elton W. Sutherling, (SC) USN, Fleet Supply Officer, CINCPACFLT

5 Sep 1967 - Pearl Harbor - Admiral Roy L. Johnson, USN, CINCPACFLT

5 Sep 1967 - Pearl Harbor - RAdm Ralph W. Cousins, USN, CINCPACFLT Staff, (CTF 77 Designee)

5 Sep 1967 - Pearl Harbor - RAdm William F. (Butch) Bringle, USN, DCOS Operations and Plans, CINCPACFLT

6 Sep 1967 - San Diego - VAdm Allen M. Shinn, USN, COMNAVAIRPAC

11 Sep 1967 - Washington, D. C. - VAdm Thomas F. Connolly, USN, Deputy CNO (Air) and assembled aviation flag officers

11 Sep 1967 - Washington, D. C. - VAdm Benedict J. Semmes, Jr., USN Chief of Naval Personnel
RAdm Bernard M. Strean, USN, Deputy Chief of Naval Personnel

14-15 Sep 1967 - PG School, Monterey - Honorable Charles F. Baird, Assistant Secretary of the Navy (Financial Management)

16 Sep 1967 - San Francisco - RAdm William H. Groverman, Jr., USN, Commander, Western Sea Frontier

16 Sep 1967 - San Francisco - Captain Samuel J. Robinson, Jr., C.O., Naval Schools Command, Treasure Island
Commander Chester E. Elliott, C.O., Fire Fighting School, Treasure Island (Past Chief Engineer, USS CORAL SEA)

18 Sep 1967 - Norfolk, Va. - VAdm Charles T. Booth, USN, COMNAVAIRLANT

18 Sep 1967 - Norfolk, Va. - RAdm Harvey P. Lanham, USN, COMCARDIV TWO

18 Sep 1967 - Norfolk, Va. - RAdm (Select) John K. Boling, Director, Air, Surface & Electronics Warfare Div., (Past C.O., USS FORRESTAL)

19 Sep 1967 - Norfolk, Va. - RAdm Forsyth Massey, USN, Commander, Fleet Air, Quonset (Investigating Officer, FORRESTAL Incident)

19 Sep 1967 - USS FORRESTAL - Commander (b) (6), USN, Weapons Officer
Commander (b) (6), USN, Chief Engineer
LCdr (b) (6), USN, Air Department
Lieutenant (b) (6), USN, Air Department

22 Sep 1967 - Washington, D. C. - Honorable Paul R. Ignatius, Secretary of the Navy

26 Sep 1967 - Washington, D. C. - Dr. Gerald Johnson, Director of Navy Laboratories

26 Sep 1967 - Washington, D. C. - RAdm Evan P. Aurand, USN, Director Long Range Objectives Group

27 Sep 1967 - Washington, D. C. - Admiral Ignatius J. Galantin, USN, Chief of Naval Material

27 Sep 1967 - Washington, D. C. - VAdm Thomas F. Connolly, USN, Deputy CNO (Air)

27 Sep 1967 - Washington, D. C. - Ship Characteristics Board (Op-36)
VAdm Ralph D. Shifley, USN, Deputy CNO (Logistics)
RAdm Evan P. Aurand, USN, Director Long Range Objectives Group
RAdm Leroy V. Swanson, USN, Director Fleet Operations Division
RAdm Roy M. Inman, USN, Director Strike Warfare Division
RAdm David C. Richardson, USN, Asst Dep CNO (
plus fifteen lower ranks

28 Sep 1967 - Washington, D. C. - RAdm Raymond F. Du Bois, USN, Deputy Naval Inspector General

29 Sep 1967 - Washington, D. C. - Captain Kenneth Ruiz, Commanding Officer, BON HOMME RICHARD

29-30 Sep 1967 - Patuxent River, Md. - RAdm Daniel F. Smith, Jr., USN, Commander, Naval Air Test Center, Patuxent River, Maryland

2 Oct 1967 - Washington, D. C. - Admiral Ignatius J. Galantin, USN, Chief of Naval Material
RAdm Edward J. Fahy, USN, Commander, Ship Systems Command
RAdm Robert L. Townsend, USN, Commander, Naval Air Systems Command

2 Oct 1967 - Washington, D. C. - Captain J. P. Coleman, USN, Ass't Director, Air, Surface & Electronic Warfare Division
Captain I. A. Robinson, USN, Head, Air Warfare Branch

2 Oct 1967 - Washington, D. C. - Captain M. D. Courtney, USN, Op-506N

3 Oct 1967 - Washington, D. C. - RAdm Gerald E. Miller, USN, Director, Aviation Plans Division

3 Oct 1967 - Washington, D. C. - RAdm Paul Masterton, USN, Deputy Comptroller of the Navy
RAdm Eli T. Reich, USN, Asst Dep CNO (Log)

3 Oct 1967 - Washington, D. C. - RAdm Malcolm W. Cagle, USN, Director, Aviation Programs Division

4 Oct 1967 - Washington, D. C. - RAdm Philip A. Beshany, USN, Director, Submarine Warfare Division
LCdr (b) (6) , USN, Op-312E

4 Oct 1967 - Washington, D. C. - RAdm Roy M. Isaman, USN, Director, Strike Warfare Division

4 Oct 1967 - Washington, D. C. - MGen Keith B. McCutcheon, USMC, Deputy Chief of Staff (Air), USMC

6 Oct 1967 - Washington, D. C. - RAdm (Select) James C. Donaldson, Jr., USN, NAVAIRSYSCOM (Past C.O., USS HANCOCK)

9 Oct 1967 - Naval Ship Research & Development Center, Carderock, Maryland

11 Oct 1967 - Washington, D. C. - Capt C. A. Knight, USN, Op-502
Cdr (b) (6) , USN, Op-502D
LCdr (b) (6) , USN, NATTC Jacksonville

DEPARTMENT OF THE NAVY
OFFICE OF THE CHIEF OF NAVAL OPERATIONS
WASHINGTON, D.C. 20350

IN REPLY REFER TO
PRSCO/JSR:lds
12 October 1967

MEMORANDUM FOR THE RECORD

From: Director, Panel to Review Safety in Carrier Operations

1. Certain visits and interviews were conducted by the Director, either alone or in company with very few of the Panel members. To serve as a reference the following information is recorded.

15 Aug 1967 - Washington, D.C. - Admiral Thomas H. Moorer, USN, Chief of Naval Operations
Admiral Horacio Rivero, Jr., USN, Vice Chief of Naval Operations

The terms of reference for the Panel and a general plan for procedure were discussed.

17 Aug 1967 - Washington, D.C. - RAdm Noel A. M. Gayler, USN, Asst Deputy CNO (Development)

A conversation was conducted in the Director's office during which RAdm Gayler's general ideas on the subject of carrier safety was discussed. He said that we should not concern ourselves to the point of fascination with preventing fires on the flight deck, but instead focus on controlling them. Massive and instantaneous suppression is indicated from only a few well chosen remote control points. He said five men on the end of a hose run out from the deck edge was a rather antiquated method of fighting fires in light of the many developments which have transpired in the art since the end of World War II. He thought we should find some way of compartmenting the flight deck in order to limit the area of the fire, that there should be scuppers to drain away spilled fuels, a method of quick disposal of ordnance. He mentioned that bombs and rockets might be insulated or incapsulated to resist heat, that jellied fuel or sponges within fuel tanks might prevent spillage, and finally that something akin to a flight deck bulldozer should be provided for jettisoning aircraft.

17 Aug 1967 - Washington, D.C. - RAdm Henry L. Miller, USN, Chief of Information

We discussed public information policy and the Director expressed his desire that our work be conducted with minimum possible fanfare.

18 Aug 1967 - Washington, D.C. - Captain John E. (Blackie) Kennedy, USN, Past C.O., USS INDEPENDENCE

Engaged in a general discussion of carrier operations at lunch. He stressed personnel training and present deficiencies due to personnel turnover.

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18 Aug 1967 - Washington, D.C. - RAdm (Select) Martin D. Carmody, USN, - Director, Command Control & Electronics Division (Past C.O., USS KITTY HAWK)

He described in some detail the method which he had used to exhort his crew to best performance in casualties. He had made many speeches over the ship's announcing system pointing out the importance to safety of the performance of each individual man in the ship's company. He had one serious fire caused by a blown gasket in the flange of a fuel oil line under high pressure in one of the four machinery spaces. The oil squirted out in a fine vapor and was ignited. In the ensuing fire he lost two men. A functioning fixed fire smothering system is a requirement for machinery spaces, particularly those of Forrestal Class in which there is not only a main engine but also two high pressure boilers in the same compartment. As a result of this fire sheet metal guards were placed around all flanges so that if a gasket were ruptured the oil spray resulting from it would be contained rather than being permitted to spray across the machinery space. On another subject he made an unique suggestion that Carrier Division Commanders and their staffs be subjected to an operational readiness inspection. He said fire plugs on KITTY HAWK were outside the hangar envelope and hoses had to be led through doors to the interior of the hangar. He recommended that the Director interview Captain Shelly Pittman who was Weapons Officer on KITTY HAWK.

19 Aug 1967 - Washington, D.C. - Captain (Select) Shelly Pittman, USN, NAVAIRSYSCOM (Past Weapons Officer on KITTY HAWK)

He visited the Director at the Army-Navy Club where ordnance operations on CVAs were discussed. He said the key to safety was in the education of personnel and that all officers and petty officers should mentally appoint themselves safety officers and watch for violations of safety in the handling of ordnance. He cited the case of a lad on his way to breakfast on KITTY HAWK picking up a bomb fuze from its rack and carrying it along with him to breakfast. He was apprehended in the breakfast line, spinning the arming vane of the fuze for his amusement. He cited another "near miss", - the jet blast from an aircraft parked forward of the island impinged on a bomb heating it to the point at which the explosive began to bubble out of its case. He noted this very dangerous situation in time to grab the bomb dolly and wheel the bomb out of the way.

19 Aug 1967 - Washington, D.C. - VAdm Thomas F. Connolly, USN, Deputy CNO (Air)
RAdm David C. Richardson, USN, Asst Dep CNO (Air)

RAdm James L. Holloway, III and the Director called in company to discuss the Panel's charter and proposed procedure. All possible assistance was offered.

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19 Aug 1967 - Washington, D.C. - Admiral Thomas H. Moorer, USN, Chief of Naval Operations

The Director joined Admiral Moorer for Saturday lunch alone in his office. He outlined his many budget problems and informed the Director that he proposes to make CTF 77 a permanent assignment with Subic Bay as home port. The objective is to lend stability to command in the very exacting operations conducted from the carriers in the Gulf of Tonkin.

21-22 Aug 1967 - Pearl Harbor - Admiral Roy L. Johnson, USN, CINCPACFLT

During the stay at Pearl Harbor, and after a formal briefing of the Panel, the Director had many opportunities for informal conversations with Admiral Johnson. All the discussions have been reflected in the Director's discussions with the Panel.

4 Sep 1967 - Subic Bay, P.I. - RAdm Fillmore B. Gilkeson, USN, Commander Naval Base, Subic Bay
Captain Zebulon V. (Zeb) Knott, USN, C.O., USS DIAMOND HEAD (AE-19)

RAdm Gilkeson's briefing on the facilities and operations at Subic Bay have been written up by Cdr (b) (6) of the Panel. Upon the conclusion of our briefing by RAdm Gilkeson, it was intended to visit USS DIAMOND HEAD (AE-19) to observe first-hand the stowage and handling facilities for handling ammunition. Time prevented, however, and an unhurried interview with Captain Zeb Knott, her Commanding Officer, was substituted. He said that handling facilities were generally satisfactory on his ship, that the employment of helicopters for so-called vertical replenishment is a desirable feature, and that clearance along the main deck outboard of the hatches was a desirable feature so that ammunition could be worked the entire length of the ship. When asked what he regarded as his most dangerous item of ammunition, he cited the CBU-24 and the recent poor quality control which had permitted improper assembly within that weapon. He said that he brought back from replenishments a great volume of wooden crates. He pointed out that it was very undesirable to have floating debris in the Gulf of Tonkin because of the frequent searches for a man in the water when each piece of debris might require examination lest it be the man for whom the search was being conducted.

5 Sep 1967 - Pearl Harbor - Captain Dan T. Drain, USN, Chief of Staff, COMSERVPAC
RAdm Elton W. Sutherling, (SC) USN, Fleet Supply Officer, CINCPACFLT

The Panel party debriefed on the Gulf of Tonkin experiences and received an explanation of Service Force Pacific operations stressing particularly ammunition supply.

5 Sep 1967 - Pearl Harbor - Admiral Roy L. Johnson, USN, CINCPACFLT

In addition to the Panel party's very thorough debriefing before Admiral Johnson, the Director had many personal contacts with him. Those pertinent ideas obtained in these discussions have been passed on to the Panel.

5 Sep 1967 - Pearl Harbor - RAdm Ralph W. Cousins, USN, CINCPACFLT Staff, (CTF 77 Designee)

Met at the Director's quarters and in addition to the Director's debrief, copies were left with RAdm Cousins of RAdm Ely Massey's message on the details of the FORRESTAL casualty, and also the Director's memorandum to Admiral Moorer summarizing the WestPac experiences.

5 Sep 1967 - Pearl Harbor - RAdm William F. (Butch) Bringle, USN, DCOS Operations and Plans, CINCPACFLT

The visit was made at the Director's quarters when the Director conducted an informal debrief. Discussed also were targets, border violations and modes of operations.

6 Sep 1967 - San Diego - VAdm Allen M. Shinn, USN, COMNAVAIRPAC

In addition to the Panel party's formal debrief and a briefing received from COMNAVAIRPAC, the Director had a number of further personal contacts with VAdm Shinn. Discussed in some detail was the division of cognizance within the Material Command of ordnance and ordnance safety; also the dispersion of responsibility within the staff of the Chief of Naval Operations.

11 Sep 1967 - Washington, D.C. - VAdm Thomas F. Connolly, USN, Deputy CNO (Air) and assembled aviation flag officers

A rather thorough debrief of the Panel's WestPac party visit to Task Force 77 was done by the Director before this august body of aviators.

11 Sep 1967 - Washington, D.C. - VAdm Benedict J. Semmes, Jr., USN, Chief of Naval Personnel
RAdm Bernard M. Strean, USN, Deputy Chief of Naval Personnel

The Director debriefed the visit to Task Force 77 before VAdm Semmes and RAdm Strean.

14-15 Sep 1967 - PG School, Monterey - Honorable Charles F. Baird, Assistant Secretary of the Navy (Financial Management)

The Director's flight to the Post Graduate School in Mr. Baird's aircraft and many contacts with Mr. Baird at the PG School gave opportunity to

brief him on the visit to Task Force 77. In Advisory Board sessions and upon determining that the naval aviation billets in the PG School were only about 15% to 18% filled, the Director made a very strong point before the board and Mr. Baird of deep concern for the future because the aviators which should be training to fulfill the needs of the Navy for the future were not present at the PG School. The Director stated that the Navy should have sufficient resources and sufficient reserve to rig for the long haul in the Vietnam affair, and both fight and look to the future at the same time.

16 Sep 1967 - San Francisco - RAdm William H. Groverman, Jr., USN,
Commander, Western Sea Frontier

RAdm Groverman was the Director's host for the day and overnite on a visit to Treasure Island to examine the fire fighting school there. This extensive contact permitted a debrief of the Task Force 77 visit.

16 Sep 1967 - San Francisco - Captain Samuel J. Robinson, Jr., C.O.,
Naval Schools Command, Treasure Island
Commander Chester E. Elliott, C.O.,
Fire Fighting School, Treasure Island
(Past Chief Engineer, USS CORAL SEA)

Captain Robinson's activity is directly under the Bureau of Naval Personnel as part of the Schools System. Captain Robinson took the Director to the Fire Fighting School where they were met by its commanding officer, Commander Elliott. The equipment was examined, a Purple K (potassium carbonate) dry chemical fire extinguisher was completely disassembled, and the adequate facilities of the school were inspected. Although the school was prepared to give it, the Director did not ask for a live demonstration because it would have followed the same pattern as that witnessed at San Diego. The steel mock-up of an airplane with a bomb under it, used so effectively at the TraPac school in San Diego, was not a part of the equipment at Treasure Island. The Director described it and told of the drill conducted to keep the bomb cool while the fire around the airplane mock-up was being extinguished. A difficulty with the Purple K extinguisher was stated to be that once the extinguisher had been used and turned off, it could not be allowed to stand under pressure since the powder would pack so tightly in the hose and nozzle that it would no longer flow. Therefore, when a Purple K extinguisher is used the pressure in it should be relieved and the powder tapped back down from the hose into the container. Cdr Elliott stated emphatically that as past Chief Engineer of CORAL SEA he did not favor divorcing the Damage Control Assistant (DCA) from the Engineer Department. He said the work of the DCA was too closely allied with the Engineer Department for a division of responsibility which would be inherent in a split of the organization. Cdr Elliott stated that the Director's idea of a traveling Fire Fighting School to visit and train carrier air wing personnel at their bases would be a practicable thing to do, provided equipment and funds were devoted to this project.

18 Sep 1967 - Norfolk, Va. - VAdm Charles T. Booth, USN, COMNAVAIRLANT

Many chances afforded for informal conversations in addition to our Panel debrief and COMNAVAIRLANT's formal briefing. VAdm Booth's earlier despatch on various safety requirements in handling ordnance aboard ship had been the occasion for INTREPID to respond that she was unable to comply and yet fulfill her operational commitments in Task Force 77. VAdm Booth gave me a copy of this exchange of despatches. The incident emphasizes the fact that a wise compromise must be made between very stringent safety regulations and the practical operation of CVAs in a Vietnam war.

18 Sep 1967 - Norfolk, Va. - RAdm Harvey P. Lanham, USN, COMCARDIV TWO

RAdm Lanham was embarked with staff on board FORRESTAL at the time of her flight deck fire on 29 July 1967. He seemed satisfied that once the extensive fire had been ignited on the flight deck of FORRESTAL that fire fighting with the equipment provided was conducted with as much skill as could be reasonably expected. He made a strong point of the training of pilots and the upkeep of the fairly complicated avionics fire control gear in the airplanes, saying that he felt with better training and upkeep more ordnance could be placed on target with somewhat less effort. This was an important point which must be emphasized in our panel report.

18 Sep 1967 - Norfolk, Va. - RAdm (Select) John K. Boling, Director, Air, Surface & Electronics Warfare Div., (Past C.O., USS FORRESTAL)

The Director had a private brief by Captain Boling in which he made a strong case for the readiness of his ship and crew to attempt to handle the casualty on the flight deck on 29 July 1967. He stated that connecting the firing circuit after a no-voltage check had been made with the aircraft on internal power was an established procedure in preparing the LAU 10/A rocket pod and the carrying aircraft for launching. Captain Boling left the Director a large scale drawing of the flight deck with the arrangements of aircraft, the ordnance each carried, the names of pilots and intercept officers, depicted on it. Also, three overlays; - one, the extent of the fire at the time of the first explosion; a second with the position of the various foam and salt water hoses at the time of the first explosion; and a reconstruction in as much detail as was known of the location of each of the seven explosions.

19 Sep 1967 - Norfolk, Va. - RAdm Forsyth Massey, USN, Commander, Fleet Air, Quonset (Investigating Officer, FORRESTAL Incident)

The Director and RAdm Massey talked together for an hour at LANTFLT Headquarters. FORRESTAL had been average to excellent in her work-up

for deployment. The ordnance handling methods used on the day of the casualty were the same as had been used in the Operational Readiness Inspection (ORI). He said the LAU 10/A launcher terminology and instructions were completely inadequate. He said further that in perfecting our nuclear weapons capability we had neglected to inculcate the same excellence in dealing with conventional ammunition.

19 Sep 1967 - USS FORRESTAL - Commander (b) (6), USN, Weapons Officer
Commander (b) (6), USN, Chief Engineer
LCdr (b) (6), USN, Air Department
Lieutenant (b) (6), USN, Air Department

In these interviews it was brought out that the "C" Division must have a good 6700 officer. FORRESTAL's winches are slow for the underway replenishment of ammunition. The location of the battery locker and the fact it had no drain overboard had caused a death by chlorine gas in the fire of 29 July. The battery locker should be relocated to be less awkward of access. Some of the furnishings which have contributed to the habitability of the ship are quite flammable, such as rubber mattresses. Light weight furniture was crushed and thrown about, jamming access. The length of time it takes to get a Shipalt through the system invites jury rigging by ship's force which may produce trouble. A question was raised as to the interim WestPac allowance list promulgated by Airlant. The opinion was that this list was not realistic. FORRESTAL had converted the forward SASS space into a bomb assembly room. (b) (3) (A).
He regarded FORRESTAL's fire pump capability as generally adequate. He suggested that fire stations should be arranged identically throughout the ship. Photographs of them should be available for instruction and instructions should be standardized. Lt. (b) (6) thought that the water washdown system on carrier flight decks were not of sufficient volume for conflagration control.

22 Sep 1967 - Washington, D.C. - Honorable Paul R. Ignatius, Secretary of the Navy

In a twenty minute call the Director debriefed on the WestPac trip and showed the flight deck diagram of FORRESTAL's accident. Mr. Ignatius was very interested. He stated that the Navy could not afford any more major accidents to CVAs.

26 Sep 1967 - Washington, D.C. - Dr. Gerald Johnson, Director of Navy Laboratories

Dr. (b) (6) and the Director took Dr. Johnson to lunch at the Army-Navy Club and were afforded an excellent opportunity to discuss with him in detail the work of the Panel.

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26 Sep 1967 - Washington, D.C. - RAdm Evan P. Aurand, USN, Director, Long Range Objectives Group

RAdm Aurand called late in the afternoon with a proposal to use the water jet as developed for propulsion of the hydrofoil building at Boeing. He said here was a high volume source of water which might be applied to control flight deck conflagrations. He spoke of a fluidic method of combining jets of liquid to control the direction of the jet. He intimated that the igniter for all rockets was more sensitive than desirable because of multi-Service standardization, - i.e., other applications required a sensitive ignition squib. He said the overseas movement in Vietnam amounted to approximately 900,000 short tons per month. He said in studies he had conducted on the cost of CVA Task Group operations, 40% of the cost was in aircraft and their weapons, 30% in defense, 20% in facilities for flying aircraft, and 10% in the hull and propulsion of the ship.

27 Sep 1967 - Washington, D.C. - Admiral Ignatius J. Galantin, USN, Chief of Naval Material

Lunch was followed by a discussion at some length of the present organization of the Material Command. The Director asked him to think about a CVA Project Officer and give his opinion later.

27 Sep 1967 - Washington, D.C. - VAdm Thomas F. Connolly, USN, Deputy CNO (Air)

In a meeting alone with him the Director made a quick summary of panel progress to date.

27 Sep 1967 - Washington, D.C. - Ship Characteristics Board (Op-36)

Present: VAdm Ralph L. Shifley, USN, Deputy CNO (Logistics)
RAdm Evan P. Aurand, USN, Director Long Range Objectives Group
RAdm Leroy V. Swanson, USN, Director Fleet Operations Division
RAdm Roy M. Isaman, USN, Director, Strike Warfare Division
RAdm David C. Richardson, USN, Asst Dep CNO (Air)
plus fifteen lower ranks

The Director spoke, "off the cuff", on carrier design and damage control in World War II showing a few pictures of FRANKLIN and BUNKER HILL. The 29 July 1967 casualty on FORRESTAL was explained in detail. A rekindling of the expertise in damage control and fire fighting is urgently required in the Navy in general, and in the CVAs in particular. Various ideas which had been advanced in the Panel to improve fire fighting on the flight deck of CVAs were enumerated. The requirement to improve ordnance handling through instructions and far better documentation was cited.

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28 Sep 1967 - Washington, D.C. - RAdm Raymond F. Du Bois, USN, Deputy Naval Inspector General

He gave the Director a preview of his recommendations on a Navy-wide safety organization. This was written up and passed on to the Panel members. (The Panel heard his complete briefing on the subject and his recommendations on 5 October 1967.)

29 Sep 1967 - Washington, D.C. - Captain Kenneth Ruiz, Commanding Officer, BON HOMME RICHARD

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Captain Ruiz had just completed a very successful deployment as Commanding Officer, USS BON HOMME RICHARD, with Carrier Air Wing 17 embarked, Commander Jack Monger. During their deployment they had damaged or destroyed 27 Migs and engaged in many heavy attacks on facilities in North Vietnam. He had had three major operational accidents; two of these were with new pilots. He explained that about 23% of his embarked air wing pilots were new. His losses per 1000 combat sorties were: 1.26 pilots, 1.8 aircraft, and 10.7 aircraft damaged. On the subject of flight deck conflagration control, he said his ship had a 2½" diameter pipe mounted above and even with the deck edge coaming to prevent airplanes going over the side. One section of this pipe he had had perforated to serve as an experimental fixed water spray. He thought this would be beneficial in flight deck fires. The Director promised to support him in getting a sprinkling system for the ordnance parking area outboard to starboard of the island, and also on the hangar deck over the area used for ready ordnance stowage. The doctrine on his ship on the report of a fire was to go to General Quarters automatically if no further report was received on the extent of a fire within four minutes of the first report. He asked if there were doctrine on ship maneuvering in the case of a large flight deck fire. I told him of the World War II tight turn to starboard to list the ship to port so that fire parties could start working the fire from the starboard side downhill with fuel sluicing over the port side. I told him that we knew of no standard doctrine. He said that the only proof of readiness of a foam system was to run the system for a good length of time. A short spurt did not disclose that some of his pumps had been electrically rigged improperly and ran backwards. (He said that 248 anti-aircraft missiles were launched against his air wing.) Of flight deck multiple, he said that Alpha strikes involved his largest launch, - forty aircraft.

29-30 Sep 1967 - Patuxent River, Md. - RAdm Daniel F. Smith, Jr., USN Commander, Naval Air Test Center, Patuxent River, Maryland

In addition to the excellent briefing and walk-through of Naval Air ordnance provided by Patuxent River, the Director remained overnite with RAdm Smith with the opportunity to continue the discussion on naval air ordnance. RAdm Smith's outstanding recommendation was for the simplification of Navy air ordnance. While it was agreed that new

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weapon types and new equipment should be available in the fastest possible time, there still should be a very considerable effort devoted to standardizing and reducing the truly overwhelming variety in ordnance.

2 Oct 1967 - Washington, D.C. - Admiral Ignatius J. Galantin, USN, Chief of Naval Material
RAdm Edward J. Fahy, USN, Commander, Ship Systems Command
RAdm Robert L. Townsend, USN, Commander, Naval Air Systems Command

The Director's conversations with these officers have been written up in two memoranda dated 3 October 1967.

2 Oct 1967 - Washington, D.C. - Captain J. P. Coleman, USN, Ass't Director, Air, Surface & Electronic Warfare Division
Captain J. A. Robinson, USN, Head, Air Warfare Branch

These officers ran through the development cycle from an Advanced Development Objective (ADO), Proposed Technical Approach (PTA), Technical Specification Operational Requirement (TSOR), Technical Development Project (TDP), Specific Operational Requirement (SOR), to Contract Definition Phase (CDP). Future carrier aircraft were discussed. The so-called VFAX is pretty far in the future with funding only for an engine development in FY 1968, avionics in FY 1969, and the CDP, possibly, in FY 1970. It was said that there is $2M in the '69 budget, $3M in '70 for advanced development of damage control in CVAs.

2 Oct 1967 - Washington, D.C. - Captain N. D. Courtney, USN, Op-506K

Called at the office and engaged in a discussion of training in carrier based aircraft. The recommendations of RAdm Cayler as to CVA safety were reviewed and endorsed. (See 17 August, above, for these recommendations)

3 Oct 1967 - Washington, D.C. - RAdm Gerald E. Miller, USN, Director, Aviation Plans, Division

Programs and the tight financial situation were discussed. He stated that the past strength of 16,000 pilots had dropped to 13,000 and that there were approximately another 5000 pilots in the U.S. Marine Corps. The PG School quota of around 500 aviators has only 80-85 assigned, i.e., it is 16%-17% filled.

3 Oct 1967 - Washington, D.C. - RAdm Paul Masterton, USN, Deputy Comptroller of the Navy
RAdm Eli T. Reich, USN, Asst Dep CNO (Log)

RAdm Masterton stated that funds for ship improvements had been increased by about a factor of two between FY 1968 and FY 1969. Thus far, the

amount ($707M) for '69 has held up in budget reviews. RAdm Masterton recommended that the Panel become familiar with the "Sub Safe" program aimed at improving submarine safety as a result of the THRESHER accident. He said a parallel could be found in our Panel assignment.

3 Oct 1967 - Washington, D.C. - RAdm Malcolm W. Cagle, USN, Director, Aviation Programs Division

The present assignment of aircraft to the Fleet were reviewed in detail noting that the five months training period was being poorly supplied with airplanes.

4 Oct 1967 - Washington, D.C. - RAdm Philip A. Beshany, USN, Director, Submarine Warfare Division
LCdr (b) (6), USN, Op-312E

RAdm Beshany explained the Sub Safe program in some detail and stated that a Submarine Safety Center had been established in New London in connection with the program. The program uncovered many shortcomings in submarine personnel training, submarine construction and internal arrangement. Shipyards obtained waivers in meeting requirements and were prone to regard requirments as goals rather than something to be met. The submarine design was computerized and the effects of various casualties traced. A very likely cause of disaster was salt water piping under sea pressure placed near electrical switch boards where a piping failure would throw salt water over a switch board and cause short circuiting. The ability to quench a fire through increasing the nitrogen content along with increasing the pressure was mentioned. For example, a 14% oxygen atmosphere greatly reduces fire hazard but will cause anoxia. If, however, the space is pressurized at 14% oxygen, the compressed atmosphere becomes sufficient to support life.

4 Oct 1967 - Washington, D.C. - RAdm Roy M. Isaman, USN, Director, Strike Warfare Division

The general readiness of CVAs was discussed and certain shortcuts in inspections, shakedowns, and the like, have degraded readiness. The paucity of aircraft during a five months training up period was again mentioned. RAdm Isaman cited the SAC surprise safety inspections held at unannounced times by a corps of professionals. This very effectively focussed attention on safety factors in SAC squadrons.

4 Oct 1967 - Washington, D.C. - MGen Keith B. McCutcheon, USMC, Deputy Chief of Staff (Air), USMC

MGen McCutcheon discussed airplanes and the level of training among pilots and squadron personnel. He mentioned two incidents in USMC aviation in Vietnam. One was the inadvertent firing of a 2.75 rocket down a line of parked aircraft which happily missed all and wound up harmlessly in a sandbagged revetment. Another incident was that of a mechanic who stood on the hood of a jeep to repack a drag chute in the

tail of an aircraft while another mechanic was refuelling the aircraft. Fuel from an over filled tank fell on the running engine of the jeep, ignited, and caused an extensive fire. MGen McCutcheon said that 125 Marine Corps student pilots were to be trained this year in Air Force facilities because of lack of training capability within the Navy.

6 Oct 1967 - Washington, D.C. - RAdm (Select) James C. Donaldson, Jr., USN
NAVAIRSYSCOM (Past C.O. USS HANCOCK)

During his one year in command, 12,000 combat missions were flown from the deck of HANCOCK. One serious fire was caused by the return of a battle damaged A-4 when flack holes in fuel tanks permitted a large amount of fuel to be spilled on the deck. This fire was successfully extinguished using foam and salt water. As was noted by INTREPID and ORISKANY, fires in the lagging of steam pipe leading to the catapult because of jet fuel or oil soaking into the lagging was cited as a common cause of fires. A means of collecting leaking fuel from damaged aircraft was developed on HANCOCK. It was a combination of a funnel on a hoze, and later a drip pan on top of, and draining into, a drop tank. The drop tank was on a dolly so that it might be rolled under an aircraft to catch leaking fuel. The handling of liquid oxygen was cited as a fire and personnel hazard.

9 Oct 1967 - Naval Ship Research & Development Center, Carderock, Maryland

The Director gave a briefing to the Navy Laboratory Research Planning Panel for Enhancement of Carrier Survivability. Dr. (b) (6) acted as program coordinator. The Director spoke for one hour, and, after a break, engaged in a discussion period for another half hour. The Director's talk was similar to that before the Ship Characteristics Board. The Director began with a brief history of carrier operations, showed photographs of BUNKER HILL and FRANKLIN as examples of casualty handling during World War II, then passed on into the details of the Panel's experience, explaining the things the Panel regards as necessary to enhance safety.

11 Oct 1967 - Washington, D.C. - Capt C. A. Knight, USN, Op-562
Cdr (b) (6), USN, Op-562D
LCdr (b) (6), USN, NATTC Jacksonville

LCdr (b) (6) described the Naval Air Technical Training Center's schools for aviation ordnancemen. He pointed out that about 70% of fleet ordnance personnel are school trained. The remainder are selected in the fleet. He stated that prior to the FORRESTAL accident that the school was teaching student ordnance personnel to plug the LAU 10 in while the aircraft were parked in the pack.

James S. Russell
JAMES S. RUSSELL
Admiral, U.S. Navy (Ret)

DECLASSIFIED

PRSCO/TJE:js
4 September 1967

MEMORANDUM FOR THE RECORD

FROM: Recorder, Panel to Review Safety in Carrier Operations

1. A meeting with Rear Admiral Gilkeson, Commander, Naval Base, Subic Bay was held in his office on 4 September 1967. Admiral Russell, RAdm Buie, Capt McCall, Cdr (b) (6) and Cdr (b) (6) attended.

2. RAdm Gilkeson began his presentation by pointing out the size and boundries of the Naval Base Subic. He stated that his role was primarily that of a coordinator for the various commands within the area.

3. NAS Cubi Pt is now receiving 22,000 landings per month. This high traffic volume coupled with heavy weights of the aircraft being handled is breaking down the semi-rigid center portions of the runway. The rigid 500 foot concrete ends do not receive initial landing shocks because of the location of the field mirror. Reinforcement of 500 feet inboard of the 500 feet rigid concrete ends is programmed. Instead of this, an additional 500 feet outboard of the rigid 500 feet concrete ends is needed on each end of the runway. An additional 7,000 feet parallel strip is also needed; this would cost about 4 million dollars. It is planned that the field be closed for about 45 days in the fall to all but COD aircraft in order to repair the runway.

4. Cubi Pt is presently overhauling MK 4 Gun Pods, ERR/TER racks, and Drop Tanks. In addition, repair personnel are repairing battle damage to aircraft.

5. The ship repair facility is doing major work. It very rapidly re-gunned the Boston and Canberra. Present plans call for two new dry docks.

6. The station has about 16,000 Philippino workers 98% of which are paid by appropriated funds. There are 6,000 Americans attached.

7. Base housing is a critical problem with 750 families living off station in Olongapo and only 670 on the base. In spite of this, the station is faced with a possible budget cut. Present waiting list for housing is longer than a normal tour. Present plans call for construction of about 100 enlisted quarters. Budget for next year, which is in question, provides for 450 enlisted and 50 officers quarters.

8. Present on-station electrical generating capacity is below that required for all power requirements. Because of this many people are subscribing to commercial power which has as many as 6-7 outages per month.

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9. The Navy POL area is gaining by leaps and bounds. Subic has been charged with the responsibility to supply Clark AFB. A pipeline is being built to supply Clark.

10. The Naval Hospital has only a 103 bed capacity. Quonset extensions are being constructed to extend this capacity to 178 beds.

11. The base supply department stocks about 100 million dollars worth of goods amounting to 200,000 line items. Sea-land containers have helped significantly in stopping pilferage of these items. In addition present ship scheduling, which provides that a ship arrive every 11 days, is helpful in keeping adequate stock and safely allowing lower stock levels. This, along with automatic data processing, is helping inventory control.

12. PBR's have been used for Bay patrol and this, along with restrictions on Banka boats, has helped in controlling smuggling and thievery from ships in the bay. Fortunately unloading has been expedited and the number of ships in the harbor has thus been very much reduced. This reduction has allowed the raising of restrictions on native boats to some extent -- an aid in bettering community relations.

13. The base needs at least two YTB's to improve ship handling and improve safety around piers. The movement of an AE near a burning pier would be a real problem now.

Very respectfully,

(b) (6)

Cdr, USN

DECLASSIFIED

PRSCO/PHE:js
20 September 1967

MEMORANDUM FOR THE RECORD

FROM: Recorder, Panel to Review Safety in Carrier Operations (PRSCO)

1. The Director PRSCO visited the USS FORRESTAL on 19 September and interviewed the following ship's officers in the company of the ship's Commanding Officer, Captain Robert Baldwin:

Cdr (b) (6), Weapons Officer
Cdr [redacted], Chief Engineer
LCdr (b) (6), Air Department
Lt (b) (6), Air Department

2. Cdr (b) (6) background included:

Destroyer and Cruiser experience
Masters Degree in Ordnance Engineering
Armed Forces Staff College
Practical work in Warhead Design while attached to BUWEPS

Cdr (b) (6) stressed his lack of background in ordnance hardware and CVA operations. His remarks emphasized the problem of fatigue in ordnance handling. He stated that all ordnance handling was completed on a unit basis and that the environment for the operation was conducive to error in assembly. The assembly areas include 1/3 of the forward and after mess decks. He recommended that these working areas be segregated and that adequate supervisory personnel be assigned to ensure safety and efficiency in bomb assembly. The problem of poor vertical movement was discussed. Cdr (b) (6) stated that no controlled rate of weapons flow could be established because of elevator problems. Aircraft elevators were frequently used for ordnance movement.

The assignment of a 6700 Ordnance Handling Officer to CVA's was highly recommended.

Cdr (b) (6) said that some pyrotechnics burned as a result of the fire and explosions. He further stated that the 02 level battery locker caused considerable trouble when the batteries casings ruptured and the battery acid with salt water created chlorine gas. At least one and maybe two men succumbed to this gas. He recommended that a drainage system be built into this type compartment.

The habitability and comfort of the ship was discussed and Cdr (b) (6) stated that the light North Hampton type bunks and their supporting frames were tossed about in such a fashion as to cause severe obstacles to fire-fighting personnel. He also said that burning mattresses and wax paper cups created severe fires.

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The Destructor 36 was handled by Special Weapons personnel on board FORRESTAL. Cdr (b) (6) remarked that ordnance loading equipment was unstandard and locally manufactured.

He said that the responsibility for ordnance was not clearly established between the Wing and the Ship. This didn't cause any real problems but did become a matter of some concern during the investigation. He further stated that to the best of his knowledge the Flight Deck procedures used during the ORI were the same as those employed on the line. Specifically, Zunis were plugged in in the pack.

Cdr (b) (6) stated that the ship's ordnance load was incorrect when she left the USA. The AIRLANT interim WESTPAC Allowance List was the governing paper in determining what was to be carried.

3. Cdr (b) (6), the Ship's Chief Engineer, was interviewed next. His background included:

Duty with the Board of Inspection and Survey
He is an EDO

Cdr (b) (6) pointed out the need for quicker reaction capability in fire fighting equipment. He stated that reeling a hose out and getting activation in less than three minutes is almost impossible. The conventional Fog Foam Hose has to be reeled all the way out before it can be used. A kink in this type hose will cause seals to blow because of the positive displacement pump in the system. He stated that FORRESTAL's water washdown system consisted of hoses which had to be rolled out on deck.

Many of the deaths on the ship could have been averted if men had been awake and alert. The night check crews were asleep and thus had little chance to escape. The Post Office and Carpenter Shop were demolished but the people who had been there survived because they left these spaces immediately when G.Q. sounded.

Cdr (b) (6) experience with INSURV caused him to increase his supply of some items over those allowed. He stated a need for more canisters for the OBA; in addition, the allowance of foam should be doubled. (b) (3) (A) [redacted]

Cdr (b) (6) made several specific recommendations for the future:

1. Study berthing location.
2. Provide for drainage of battery lockers in a fire.
3. Provide for quick liquid oxygen dump.
4. Standardize fog foam stations.
5. Put water washdown system in FORRESTAL's deck.

4. LCdr (b) (6) and Lt (b) (6) of the Air Department stated a requirement for more bomb skids, more elevators, particularly a deck edge bomb elevator, and more jettison chutes.

Very respectfully,

(b) (6)
Cdr, USN

"R" - Organization

ANNEX E -- ORGANIZATIONAL DOCUMENTS

This annex contains copies of the essential letters, messages, and similar documents which bear special significance to work of the panel.

DECLASSIFIED

PRSACO:JES/lcc
20 August 1967

MEMORANDUM FOR ADM MOORER

From: Director, Panel to Review Safety in Aircraft Carrier Operations

Subj: Measures for improving safety

1. We would hope that the deliberations of our Panel will in no way delay the initiation of measures by yourself and other responsible persons in the Navy which in your collective good judgment will improve safety. We are aware of certain measures already begun, and there are certain others indicated in our panel discussions, all of which I should like to summarize in this memorandum.

2. The Panel is aware that the Chief of Naval Operations has directed the Chief of Naval Personnel to assign Weapons Officers to our attack carriers with most careful attention to the officers' qualifications. There is no doubt that the training of personnel, and their knowledge of the details of aircraft weapons, are key factors in our success in the safe handling of the tremendous amounts of conventional ordnance required in the present CVA operations in Southeast Asia.

3. The Panel is also aware that the Chief of Naval Operations has issued a directive to the Chief of Naval Material for the Naval Ship Systems Command to proceed forthwith toward the development of more effective means of fighting fires on the flight deck. A high velocity, high volume, stream of water from a structurally mounted nozzle in a strategic and protected location might well have swept overboard the flaming fuel which initiated the conflagration on the flight deck of FORRESTAL. Locations on the island, and pop up nozzles along the flight deck gallery, where two mirrors would permit the operator to see the flight deck yet have the shelter of the deck edge, have been discussed in the panel. It would be important to have rapid and fine control of the pointing of the nozzle, to have the force of the nozzle's reaction transmitted to the structure of the ship, and to have the shortest possible delay in getting water to the nozzle. These suggestions are intended in no way to limit the scope of the study which the Naval Ship Systems Command will undertake.

~~CONFIDENTIAL~~

PRSACO:JJS/lds
20 August 1967

4. The Panel received a briefing on, and a demonstration of, the firefighting apparatus developed at the Naval Research Laboratory, - a combination of Purple "K" and so-called light water. It is understood that procurement of a truck such as that demonstrated at NRL is underway, one for each carrier deck. It has occurred to the Panel that a follow on model of this fire truck which would be low enough to go under the wings of aircraft parked on the flight deck would be desirable.

5. Another item regarded by the Panel as of considerable urgency is the quantity per ship and the design of the Rescue Breathing Apparatus (RBA). The Panel feels that RBAs should be increased in number on the CVAs as a matter of priority. Beyond this, we would like to see the RBA replaced by one designed to be more effective in getting oxygen to the wearer and less cumbersome to the wearer in the movement of his arms.

JAMES S. RUSSELL
Director, PRSACO

Copy to:
Op-09
Op-03
Op-05
Op-07
RAdm Holloway
(For Panel)

~~CONFIDENTIAL~~

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~~CONFIDENTIAL~~

FROM: COMNAVAIRSYSCOM [illegible]

TO (ACTION): CNO (OP-05)

TO (INFO): CHNAVMAT / COMNAVAIRPAC / COMNAVAIRLANT

DRAFTED BY: PRIMARY [illegible]

PREPARED BY: ADM JAMES S. RUSSELL

RELEASED BY: (b) (6) [redacted]

DATE: 1 SEP 1967

PRECEDENCE: FLASH / PRIORITY / IMMEDIATE / ROUTINE

CONF

ADMIRAL RUSSELL SENDS

FLIGHT DECK CONFLAGRATION CONTROL

1. [illegible] TO THE FLIGHT DECK [illegible] OF [illegible] TO [illegible] IN AREA OF [illegible] TO COOL [illegible] AND [illegible]

2. [illegible] CORAL SEA AVAILABLE. [illegible] HAS [illegible]

3. RECOMMEND

A. [illegible]

B. REPLACE [illegible]

C. [illegible]

D. [illegible]

PAGE ONE OF TWO PAGES

CONFIDENTIAL MESSAGE

E-3

~~CONFIDENTIAL~~

CONF

E. [illegible] ADEQUACY OF FRESH PUMPS TO PROVIDE WATER AT [illegible] PRESSURE. (NOTE: AIR CONDITIONING COOLING AND OTHER INCREASED DEMANDS ON FRESH WATER SUPPLY MAY REQUIRE ADDITIONAL [illegible] PUMPS.)

F. [illegible] SPRAY [illegible] STANDARD [illegible] TO [illegible] WASHDOWN AND PROVIDE [illegible] VOLUME OF SPRAY [illegible] PRESENT [illegible] FOR [illegible] AND OTHER [illegible].

G. [illegible] WATER SPRAY [illegible] CONDITION [illegible]. (NOTE: [illegible] HAS [illegible].) GP4

CONFIDENTIAL (When filled in)

U. S. NAVAL COMMUNICATIONS [illegible]

Message Center

ORIGINATOR'S MESSAGE
PHILCOM 2100/7 (REV. 2-66)

CLASSIFICATION: ~~CONFIDENTIAL~~ DECLASSIFIED	ORIG. OFF.: PRSACO	DATE: 2 SEP 19[illegible]
FROM: COMNAVBASE, SUBIC BAY	PREPARED BY: ADM JAMES S. RUSSELL, USN	PHONE: [illegible]
TO (ACTION): CNO (OP-05) (Mail) COMNAVAIRPAC (Mail) COMNAVAIRLANT (Mail)	CLEARED WITH: (b) (6) [redacted] SDO	PHONE:
TO (INFO):	PRECEDENCE: FLASH / IMMED / XX PRIORITY / ROUTINE	A - ACTION C - COGNIZANCE

CONF

ADMIRAL RUSSELL SENDS

AVIATION ORDNANCE HANDLING

1. FROM VISIT TO CARRIERS AND TOUR OF NAVAL MAGAZINE, SUBIC, IT IS ABUNDANTLY EVIDENT THAT [illegible] TO [illegible] IN HANDLING THE LARGE AMOUNTS OF AIRCRAFT ORDNANCE USED IN PRESENT OPERATIONS.

2. SAFETY PRECAUTIONS [illegible] TO [illegible] AND NEED TO BE STRENGTHENED. FOR EXAMPLE, ONE SHIP KEEPS AN AIRPLANE IN THE [illegible] UNTIL THE [illegible] IS DISCHARGED AND THE SAFETY PIN PLACED IN SAFE POSITION. ANOTHER SHIP HAS NOT [illegible] SAFETY PROCEDURES, BUT ADOPTED IT AFTER [illegible] IF THE TAILING AIRCRAFT DISCHARGED A [illegible] INTO [illegible] PARKED AIRCRAFT FORWARD.

3. AMMUNITION IS LOADED AND UNLOADED FROM AIRCRAFT [illegible] DUE [illegible] OF A [illegible] OF THE FACT THAT AN AIRCRAFT IS A SPARE TO BE LAUNCHED ONLY IN THE EVENT ANOTHER AIRCRAFT HAS TO ABORT. THUS IT IS OF CONSIDERABLE IMPORTANCE THAT THE [illegible] HANDLING OF THE ORDNANCE NOT DEGRADE THE SAFETY FEATURES. A CASE IN POINT WAS A BOMB WHICH HAD ITS MARK 35 DESTRUCTOR SAFETY WIRE INADVERTENTLY PULLED WHILE IT WAS BEING [illegible]. ALTHOUGH THE SAFETY WIRE WAS REPLACED, THE [illegible] [illegible] UP TO [illegible] OF THE [illegible] FUSE.

PAGE ONE OF THREE PAGES

E-5

CONFIDENTIAL MESSAGE
PHILCOM 2100/7 (8-66) [illegible]-0197-001-3900

CONFIDENTIAL (When filled in)

02060[illegible] SEP 67

NAVBASE SUBIC

DECLASSIFIED

CONFIDENTIAL (When filled in)

CONFIDENTIAL MESSAGE

PRECEDENCE	
FLASH	PRIORITY
DEFER	ROUTINE
A - ACTION	C - COMPLIANCE

PAGE TWO OF THREE PAGES

CONF

4. [illegible]

(U)

5. [illegible]

6. [illegible]

7. [illegible]

CONFIDENTIAL MESSAGE

PHILGEN 2109/7 (3-66) FIL-0197-601-3800

E-6

CONFIDENTIAL (When filled in)

DECLASSIFIED

CONFIDENTIAL (When filled in)

Message Report

ORIGINATOR'S MESSAGE
CINCPAC 2160/7 (REV. 7-64)

CLASSIFICATION CONFIDENTIAL	ORIG. DEPT.	DATE
FROM	PREPARED BY	PHONE
TO (ACTION)	CLEARED WITH	PHONE
	RELEASED BY	PHONE
TO (INFO)	PRECEDENCE: FLASH / PRIORITY / IMMED / ROUTINE — A - ACTION, C - COGNIZANCE	

PAGE THREE OF THREE PAGES

CONF

8. LOOK FORWARD TO DISCUSSING THIS PROBLEM WITH COMNAVAIRPAC UPON ARRIVAL SAN DIEGO 6 SEPT. I REGARD IT SECOND ONLY IN IMPORTANCE TO CONFLAGRATION CONTROL. GP-4

CONFIDENTIAL MESSAGE
PHILGEN 2100/7 (8-CC) 11L-0197-001-3800

CONFIDENTIAL (When filled in)

DEPARTMENT OF THE NAVY
OFFICE OF THE CHIEF OF NAVAL OPERATIONS
WASHINGTON, D.C. 20350

IN REPLY REFER TO
PRSACO/JSR:lds
Ser: 01
4 September 1967

~~CONFIDENTIAL~~

MEMORANDUM FOR ADM MOORER

From: Director, Panel to Review Safety in Aircraft Carrier Operations (PRSACO)

Subj: Visit to Aircraft Carriers at Yankee Station, 22-31 Aug 1967

1. The traveling contingent of my Panel, - RAdm Buie, Capt McCall, Cdrs (b) (6) and (b) (6) and Mr. (b) , - have just completed a most interesting and instructive visit to CONSTELLATION, INTREPID, ORISKANY and CORAL SEA operating in the Gulf of Tonkin. This memorandum will summarize our impressions.

2. Since the key to safety is the behavior of people, we examined particularly the qualifications, knowledge, and motivation of personnel. Commanding Officers are largely experienced carrier pilots, - former squadron or air wing commanders, - and there is also a good level of experience among the ships' officers. The policy of careful selection of Engineering and Weapons Officers and Damage Control Assistants is evident in the quality of those officers. The flight and hangar deck personnel, dog tired at the end of their fifteen hour day and with little rest in the heat of the lower deck living compartments, do a monumental job, and, for the most part, seem to enjoy the excitement of the deck operations and the teamwork required in handling airplanes. The embarked air wings are superbly led. Among the pilots the morale is generally good although there is some frustration over the restrictions on targets and the manner in which the war is being prosecuted. The commanding officer of one of the carriers kept a loose leaf notebook of pilots' resignations, - practically all who submitted resignations desired to finish the present combat tour, but wanted to leave the service because of family separation, and, in the case of many, the lure of a career with the commercial airlines. There is general appreciation of combat pay, extra hazardous pay for flight deck personnel, federal income tax exemption, and 10% interest on pay left on the books. The variable reenlistment bonus (ceiling $10,000) has had a good effect on the retention of critical ratings. Ordnance officers and enlisted men are intelligent and willing,

~~CONFIDENTIAL~~

overworked and prone to haste under the pressure particularly of cyclic operations when flights are landing and taking off every one and a half hours over a twelve hour period out of every twenty-four hour day.

3. The normal hazards of handling high explosives have been magnified by the great amounts of ordnance being expended on the enemy. Bombs and rockets are broken out of magazines and stowed in ready positions outboard of the island on the flight deck and on or close to the sponsons on the hangar deck. These are loaded and unloaded repeatedly as weather cancels strikes, or when spare aircraft are not required to replace an abort. Repeated handling tends to degrade the safety devices of the ordnance as well as to increase the chance of human error. Parts are worn or lost; the safing pins on the LAU-10 (4-5" rockets) launchers become corroded and make a bad electrical connection; safing wires are inadvertently pulled; connector pins are bent and fail to ground. Safety practices vary from carrier to carrier. For example, one ship held an airplane in the arresting gear until the LAU-10 launcher firing circuit is disconnected and the safety pin put in the safe position. Another ship was not taking the few seconds required for this safing procedure, but adopted it after considering what would happen if the taxiing aircraft discharged a Zuni rocket into the densely parked aircraft forward. Presumably safety practices are standardized in pre-deployment training, but training time is limited, and after deployment the introduction of new weapons and personnel turnover degrades this training. Further, the press of sustained operations is prone to inject time saving shortcuts. Descriptive and instructive literature on the various weapons is diverse, uncoordinated, and vague. Clear, concise instructions should be issued to deal specifically with each weapon. "Throw away" booklets in quantity are desirable so that each ordnanceman can read as well as be told. Aviation ordnance handling will be a prime subject which we shall discuss with the type commanders. We are aware that some of the deficiencies we have noted are being corrected. A visit to the Naval Magazine, Subic, confirmed in detail that, upon leaving WestPac, carriers turn in ordnance much of which is in poor condition.

4. Our review of conflagration control was a prime objective. Conferences with chief engineers and their damage control assistants, visits to damage control centrals and repair lockers showed conditions about as they were in World War II. Fire pump capacity has been degraded on some ships by increased demands for air conditioning. One ship desired a spare pump and spare parts for installed pumps.

Rescue Breathing Apparatus is in limited supply, and of the heavy, cumbersome, hard to start type. Some ships had gas masks at each bunk, of limited help in smoke. Some had raised arrows on the decks or lower bulkheads of passageways, - raised arrows which one could feel in the dark and smoke to determine a route of egress. Hangars are fairly well equipped to fight fire. The overhead sprinklers, water curtains, and bay closure doors, all manipulated from splinter-proof, ported, conflagration stations in each bay are reasonably adequate. Hangar fog foam monitors should be elevated from their present waist high positions to points on the bulkheads above the usual obstructions in the hangar, yet the monitors' nozzles should remain controllable in train and elevation from the hangar deck so the operator may place himself below smoke and fire. Walkie-talkie headsets as used on the flight deck should be provided to hangar crews for controlling fire fighting. An overhead water spray to cover ready ordnance parked on hangar (main) deck sponsons should be installed. ORISKANY, extremely conflagration conscious after her flare locker fire last year, has already done this.

5. Flight deck conflagration control, in which the CVAs need most help, is a subject by itself. Foam, fog and water are applied by running out a hose on the deck. The complete length of the hose must be run out on deck to avoid restrictive kinks. At least two men are required at the nozzle to hold against the reactive force of flow out the nozzle. Some starter-tractors have CO_2 bottles, a few have purple K hand held extinguishers. Bomb disposal chutes overboard are few in number; some are above the deck edge coaming so that a bomb cannot be rolled over the side without first lifting it the height of the coaming. The flight deck is pierced with numerous openings. External power leads are housed in vertical shafts extending downward at least one deck; the small armored hatch covering the shaft is open much of the time during operations and leaves the shaft as a route of flame propagation to levels below. The after bomb elevator on one ship was open and in use bringing bombs up to the flight deck during aircraft recovery. All bomb elevator openings need a netting or other closure which swings into place as the platform leaves the flight deck level so that ordnance adrift on the flight deck will not fall down the elevator shaft. Means for pulling a bomb away from burning fuel, perhaps a wire dip net, is needed, - the repair party's standard grapnel and chain tailed with manila is not suitable. Better means for jettisoning burning aircraft is another need.

6. In searching for things which can be done at the earliest to improve conflagration control on the flight deck we examined in detail

the nuclear contamination wash down system. In all ships visited, except INTREPID, which rolls out perforated hose to sprinkle the deck, the use of this system to cool hung ordnance and sluice away burning fuel appears practical. A Confidential priority despatch (ComNavBase, Subic 010132Z Sep 1967) to Op-05, info Chief of Naval Material and the Pacific and Atlantic type commanders, was sent on this subject. The wash down system has flush mounted spray heads, and a row of flush-with-the-deck nozzles pointed athwartship across the deck. These are grouped so that the flight deck area is divided into several sections, each section with its own supply from the fire main. The valve between fire main riser and wash down section is located immediately under the flight deck in spaces where manual operation is highly uncertain because of doubtful access in fire and explosion. It is proposed, therefore, that these valves be remoted, with push button control in Primary Fly and Navigating Bridge at which stations buttons could be placed, for clarity of control, on a miniature representation of the flight deck. Sprinkling needs augmentation in one area of the flight deck; that is the area outboard to starboard of the island. Heavy spray is needed here because the area is used by all the CVAs to stow large quantities of bombs and other ordnance awaiting the rearming of aircraft. We have recommended in our despatch that the wash down spray heads and nozzles be cleaned out, that some plastic pipe now in the system be replaced with metal pipe, that the wash down system be tested section by section with fresh water on each CVA at her next in port period, that repairs be effected as necessary, that added spray be provided outboard of the island, and that the remote control system be installed with the help of ship repair facilities ashore. We believe that the efficacy of using the flight deck wash down system in a JP5 fire should be proven by experimentation ashore, perhaps in conjunction with the bomb cook-off tests now in progress at Dahlgren.

7. Various other flight deck fire fighting equipments were discussed. The arrival of purple K, light water trucks, three to each CVA, was regarded with marked approval, however, flight deck officers were concerned about the deck space the trucks would occupy. Lowering the height of this fire truck in the next model was desired for passage under the wings of aircraft. One ship suggested that a 2 1/2" steel sprinkler pipe be welded to the top of the flight deck coaming to provide a high volume flow of water from the deck edge. Another ship questioned whether such a pipe could withstand the rough usage to which the top of this coaming is subjected. High pressure nozzles attached to ship's structure and controllable in train and elevation located on the island and along the flight deck gallery was regarded as a longer range project, and the thought was advanced that foam as

well as water should be available at the nozzle. Stationing plane captains with fire bottles at their airplanes when starting engines is not customary with jets, - it is one means of obtaining that early attention to a fire which is the key to its control.

8. It was repeatedly stated that all hands, officer and enlisted, ship's company and air wing, should have minimum training in fire fighting, but that such training should not be at ship's expense, that is it should be given to personnel en route to the ship. Training should include personal survival in shipboard environment in the presence of smoke, fire, or other battle damage. In similar vein, it was suggested that ship's personnel could be made familiar with the characteristics, hence basic safety requirements in handling, of air weapons prior to deployment through lectures, handling inert ordnance and viewing cutaways.

9. We have had many, many fires in CVAs, - some, like recent ones in ORISKANY and FORRESTAL, more disastrous than others. Each, however, has a lesson to teach. A brief readable summary of past fires in CVAs to be issued to prospective commanding officers and heads of department of CVAs would instill a fire consciousness difficult to achieve in any other way. Brochures like the old case histories of groundings and collisions would provide suitable treatment. Perhaps we are doing this, - if not, we should.

10. The entire Panel musters on 6 September in San Diego to spend a full day with the type commander, ComNavAirPac; a day divided between TraPac and the weapons station at Seal Beach; a day and a half with weapon designers assembled at China Lake. With the last we have some fundamental things to say, such as that red printing is unreadable in red light on the flight deck at night.

James S. Russell
JAMES S. RUSSELL
Admiral, U.S. Navy

Copy to:
Op-09
Op-03
Op-05
Op-07
CinCPacFlt
ComNavAirPac
ComNavAirLant
PRSACO Panel

NAVY DEPARTMENT

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ROUTINE

RELEASED BY (b) (6) [redacted]

DRAFT: J.L. HOLLOWAY, CAPT, USN

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R 131715Z SEP 67

FM CNO

TO ALL CHNAVMAT
CINCPACFLT
CINCLANTFLT

RETAIN

INFO COMFIRSTFLT · COMSERVLANT · ALL AE
COMSECONDFLT · COMSERVPAC · ALL AOE
COMSIXTHFLT · CTF 77 · ALL NAVMAGS
COMSEVENTHFLT · ALL TF-77 TG COMS · NAVAIRSYSCOM HQ
COMNAVAIRLANT · ALL CVA · NAVSHIPSYSCOM HQ
COMNAVAIRPAC · ALL CVS · NAVORDSYSCOM HQ

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Safety of air launched weapons (U)

1. ADM Russell and members of his Panel to Review Safety in Carrier Operations have recently completed a visit to operating CVAs at YANKEE STATION and NAVMAG Subic during which a number of dangerous material discrepancies in conventional air launched weapons were noted. Cited in the following are examples of discrepancies which appear to be not isolated and which possess a great inherent potential for disaster.

a. LAU-10 shorting devices are susceptible to corrosion and deformation and will not in fact insure safety against unintentional firing of installed ZUNI rockets. LAU-10 pods should not be plugged into aircraft firing circuit until area ahead of aircraft is entirely clear.

b. Expanding plug in rear of CBU-24 which retains bomblet in place can be improperly installed so that bomblets are not restrained in place but are free to

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PAGE	OF	PAGES		CONTROL NUMBER	DTG
1		2		1271-HS	131715Z SEP 6

tumble about in container. Improved quality control and adequate inspection will reduce or prevent this discrepancy.

(b) (3) (A)

[redacted]

d. Live ammunition has been included in shipments of inert ammunition being segregated from ships to depots. The consequence of such carelessness, which appears to be prevalent, are fatal to disaster.

4. The purpose of this message is to advise addressees of these specific discrepancies to alert handling activities of their existence and peculiarities in order that corrective action appropriate to the individual command can be taken. This is by no means a complete list of the discrepancies discovered by the Naval now does it constitute final action on the part of the Naval or by CNO, but because of the potential for disaster represented by the discrepancies listed above, immediate corrective action at all levels is

CF-4.

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Ser 17-67
14 Sept 1967

MEMORANDUM FOR DEPUTY CHIEF OF NAVAL OPERATIONS (AIR)

Subj: Allocation of Purple K Fire Extinguishers for Air Departments of Aviation Ships, recommendation for

1. A most vivid demonstration of fire fighting techniques was witnessed by the Panel to Review Safety in Aircraft Carrier Operations while visiting CENTRAPAC on 7 September 1967. A roaring motor gasoline fire was fought unsuccessfully by CO_2 but was extinguished in seconds by a hand-held 20 pound Purple K extinguisher.

2. It is understood that the Purple K extinguishers are available in the Navy supply system under the following stock numbers:

a. Dry Chemical Extinguisher, Gas Cartridge-Operated Type (30 pounds)
Federal Stock No: 4210-965-1112
Price $40.74 each

b. Fire Extinguishing Agent (Dry Chemical) Potassium Bicarbonate Base Dry Chemical Powder
Federal Stock No: 4210-965-1112
Price $12.90 per 50 pound pail

c. Refill Cartridge
Part Number 1439 for Extinguisher described in Para (a) above.
Price $1.80 each

3. At present there is no allowance for Purple K fire extinguishers for use on the flight deck. The consensus of those who are experienced in the use of "PKP" is that it would be effective on the flight deck in spite of the high winds. It is strongly recommended that each aviation ship be given a suitable allowance of these extinguishers for use by the Air Department.

PAUL D. BUIE
Rear Admiral, USN
Panel to Review Safety in Aircraft
Carrier Operations

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